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ARMY MEDICAL DEPARTMENT

REPORT

FOR THE YEAR 1869.

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VOLUME XI.

Presented to both Houses of Parliament by Command of Her Majesty.

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TO THE RIGHT HONOURABLE

THE SECRETARY OF STATE FOR WAR.

SIR,

IN accordance with instructions laid down for the conduct of business by the Director-General and Heads of Branches of the Army Medical Department, I have the honour to submit the accompanying Report on the Health of the Army in 1869, and on various matters connected with the duties of the Officers of the Department.

I have the honour to be,

SIR,

Your most obedient

Humble Servant,

T. G. LOGAN,

Director-General.

ARMY MEDICAL DEPARTMENT,

April, 1871.

TO THE DIRECTOR-GENERAL

OF THE

ARMY MEDICAL DEPARTMENT.

SIR,

We have the honour to submit the Report on the Health and Sanitary Condition of the Army for 1869.

The Statistics of the Sickness and Mortality have been framed in accordance with the Nomenclature of Diseases drawn up by a joint Committee appointed by the Royal College of Physicians of London, and adopted by the different Branches of the Public Service.

We have the honour to be,
SIR,
Your most obedient Servants,

T. GRAHAM BALFOUR,
Deputy Inspector-General,
Head of Statistical Branch.

H. H. MASSY,
Deputy Inspector-General,
Head of Sanitary Branch.

THOMAS CRAWFORD,
Deputy Inspector-General,
Head of Medical Branch.

WHITEHALL YARD,
April, 1871.

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ERRATA IN REPORT FOR 1868.

Page 39, First Table, last column, *for* 33 *read* 34.
„ 140, Line 24, *for* the 1st Battalion 19th Regiment *read* the Head-Quarters of 1st Battalion 19th Regiment, 240 strong.
„ 177, Table, heading of last column, *for* eight *read* five.
„ 214, Table, Mauritius, discharged the service as Invalids, *for* 5 *read* 25.

ARMY MEDICAL DEPARTMENT REPORT FOR 1869.

NOMENCLATURE AND CLASSIFICATION OF DISEASES.

Before proceeding to consider the details relative to the health of the Army in 1869, it seems necessary to notice briefly an important change in the Reports, arising from the introduction of a new nomenclature and classification of diseases. Those which were adopted provisionally when the publication of Annual Reports was introduced, and which have been employed in the preparation of the ten volumes already published, were nearly identical with the classification and nomenclature used by the Registrar-General of England, but were found to be in some respects defective and open to objection. In 1868, the Royal College of Physicians of London agreed to adopt a nomenclature and classification which had been prepared by a Committee of the College, assisted by representatives of the Medical Departments of the Army and Navy, the Registrar-General, and various other professional bodies, and to recommend them to the Government for use as a standard or national nomenclature. This recommendation was adopted, and the nomenclature was issued to all registered practitioners in the United Kingdom as that to be used in their Returns to the Registrar-General. At the same time it was introduced by the respective authorities into the Medical Departments of the Navy, the Army, and the Indian Service.

The new nomenclature was taken into use in the Army from 1st of January, 1869, and from that date the names in the English list of the diseases were ordered to be employed instead of the Latin, in all the Returns.

The classification thus adopted, so far as it is applicable to military statistics, was as follows :—

I. General Diseases—
- 1. Subdivision A.
- 2. „ B.

II. Local Diseases—
Diseases of the—
- 1. Nervous System.
- 2. Eye.
- 3. Ear.
- 4. Nose.
- 5. Circulatory System.
- 6. Absorbent „
- 7. Ductless Glands.
- 8. Respiratory System.
- 9. Digestive „
- 10. Urinary „
- 11. Generative „
- 12. Organs of Locomotion.
- 13. Cellular Tissue.
- 14. Cutaneous System.]

III. Conditions not necessarily associated with General or Local Diseases.

IV. Poisons.

V. Injuries, General and Local:—

1. In Battle.
2. Accidental.
3. Homicidal.
4. Self-inflicted.
5. Judicial.

VI. Surgical Operations.

In speaking of the subdivision of the class of General Diseases, the Committee remark "Section A comprehends those disorders which appear to "involve a morbid condition of the blood and which present for the most part, "but not all of them, the following characters: they run a definite course, are "attended with fever, and frequently with eruptions on the skin; are more or "less readily communicable from person to person, and possess the singular "and important property of generally protecting those who suffer from them "from a second attack. They are apt to occur epidemically. * * *

"Section B comprises for the most part disorders which are apt to invade "different parts of the same body simultaneously or in succession. These are "sometimes spoken of as constitutional diseases, and they often manifest a "tendency to transmission by inheritance."

The College declined to attach any special designation to these subdivisions, but preferred to adopt the letters A and B. We shall, however, in the course of these Reports, employ the terms Febrile group, and Constitutional group, believing that these names, though not strictly correct, will be found convenient.

Each of these subdivisions of GENERAL DISEASES contains several minor groups and individual affections, which from their important bearing on the health of the troops, it is advisable should be considered more in detail. We purpose, therefore, to subdivide them in a manner similar to that adopted with miasmatic diseases in the old classification. To avoid the necessity for explanation on this head in the various sections of the Report, we submit here the following statement of the diseases which will be included in each minor group.

I. Febrile Affections:—

1. Eruptive Fevers: Smallpox, Cow-pox, Chicken-pox, Measles, Scarlet Fever, Dengue.
2. Continued Fevers: Typhus, Cerebro-spinal, Enteric, Relapsing, Simple Continued, Febricula.
3. Yellow Fever.
4. Paroxysmal Fevers: Ague, Remittent Fever.
5. Malignant Cholera.
6. Influenza.
7. Erysipelas.
8. Other Febrile Affections.

II. Constitutional Affections:—

1. Rheumatism, in all its forms.
2. Syphilis—primary, secondary, and hereditary,
3. Scrofula and Phthisis, including Tubercular Hæmoptysis.
4. Scurvy and Purpura.
5. Anæmia.
6. Other Constitutional Affections.

During the last 30 years, venereal diseases have always formed a class by themselves in the Army Medical Returns, at first under that title, and latterly as "Enthetic Diseases." The College of Physicians did not deem it necessary to retain a separate class for these affections. From a military point of view, however, they form so important a class, especially with reference to the amount of inefficiency they cause, and of invaliding to which they gave rise,

that the Director-General decided to call for a special return of them annually from every corps, and the following instructions for its preparation were issued:—

"In this Return, under the head of Primary Syphilis, are to be included "all those cases in which the venereal sore is one of the indications of a constitutional infection, usually attended with more or less hardness of the sore and "induration of the inguinal glands, and followed by general constitutional "manifestations.

"Under Local Venereal Ulcer are to be included all cases of sores arising "from impure sexual intercourse, which are not attended or followed by any "constitutional affection. These cases are frequently attended with inflammation and suppuration of the inguinal glands, which must be considered as a "complication, and not as a separate disease.

"Care must be taken not to include in the Return cases of inflammation or "suppuration of the inguinal glands arising from causes other than venereal "affections: all such cases should be entered in the periodical returns in "class II, order 6, of the nomenclature. Cases of inflammation of the testicle "when the result of gonorrhœa (formerly returned as hernia humoralis and "gonorrhœal orchitis), should be entered as gonorrhœal epididymitis, class II, "order 10; when arising from other causes, they should be entered in the "periodical Returns as orchitis, class II, order 11, and carefully excluded "from this Return.

"Blank lines are left for the entry of any cases which may appear so "exceptional as not to justify their being included in any of the groups, but "such cases must be specially noticed, and the grounds on which they have "been deemed exceptional must invariably be appended to the Return.

"Medical Officers are requested to take particular care that all cases of "venereal diseases are included in this Return, that they are grouped in accordance with these instructions, and that none but venereal cases are "included."

From these Returns we shall be able to give all the necessary information respecting the prevalence of this important class of diseases.

Owing to the change in the nomenclature and classification, it would be impossible, without a great amount of labour, to give in the Tables the usual statement of the prevalence and mortality of the different classes of diseases during previous years. We shall therefore confine the comparison to the general results of admissions and deaths, and to the relative influence of a few of the leading diseases, particularly those now included in the class of general diseases.

I.—ON THE HEALTH OF THE TROOPS SERVING IN THE UNITED KINGDOM, IN 1869.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

United Kingdom.

THE weekly Returns of sick furnished to the Army Medical Department during the year 1869, show the average strength of the troops to have been 73,764, the admissions into hospital 58,797, the deaths 694, and the average number constantly sick 3,011. Of the deaths 51 occurred when the men were absent from their corps. These numbers give the proportions of 797 admissions, 9·41 deaths, and 40·82 constantly sick per 1,000 of mean strength, all considerably lower than in the preceding year. The following Table shows these results, contrasted with the average of the preceding nine years.

	Ratio per 1,000 of Mean Strength.		
	Admitted into Hospital.	Died.	Constantly Sick.
1869..	797	9·41	40·82
1860-68	956	9·52	48·54

These ratios show a marked reduction in the admissions into hospital, and in the proportion constantly non-effective from sickness, but a very trifling difference in the mortality compared with the average of the nine preceding years

The influence of the principal classes of diseases in causing sickness and mortality is shown in the following Table :—

United Kingdom.

Orders.	Average Strength, 73,764.	Admitted into Hospital	Died.			Ratio per 1,000 of Mean Strength, 1869.	
			With the Regiment.	Absent from the Regiment.	Total.	Admitted.	Died.
	I. *General Diseases.*						
1	Febrile Group..	3,388	34	2	36	45·9	·49
2	Constitutional..	12,781	205	22	227	173·3	3·08
	II. *Local Diseases.*						
1	Diseases of the—						
2	Nervous System	847	35	5	40	11·5	·54
3	Eye	1,183	..	..	..	16·0	..
4	Ear	271	..	..	..	3·7	..
5	Nose	19	..	..	..	·3	..
6	Circulatory System	899	128	3	131	12·2	1·78
7	Absorbent „	892	1	..	1	12·1	·01
8	Ductless Glands	4	2	..	2	·1	·03
9	Respiratory System	5,498	80	4	84	74·5	1·14
10	Digestive „	6,449	38	5	43	87·4	·58
11	Urinary „	9,023	25	1	26	122·3	·35
12	Generative „	966	..	..	..	13·1	..
13	Organs of Locomotion	363	4	..	4	4·9	·05
14	Cellular Tissue	1,512	3	..	3	20·5	·04
	Cutaneous System	7,146	..	..	..	96·9	..
	III. *Conditions, &c.*						
	Debility	267	1	..	1	3·6	·01
	IV. *Poisons*	227	13	..	13	3·1	·18
	V. *Injuries.*						
2	Accidental injuries	6,943	39	5	44	94·1	·60
3	Homicidal „	5	2	..	2	·1	·03
4	Self-inflicted „	16	31	3	34	} ·2	{ ·46
5	Judicial „	1	..	2	2	}	{ ·03
	VI. *Surgical Operations* ..	17	1	..	1	·2	·01
	No Appreciable Disease	80	..	..	..	1·1	..
	Total	58,797	642	52	694	797·1	9·41
	Average, 9 years 1860–68 ..	..	..	..	..	955·8	9·52

The admissions into hospital were 159 per 1,000 of the strength under the average of the preceding nine years; there was also a slight decrease in the deaths. GENERAL DISEASES gave rise to upwards of one-fourth of all the admissions and to nearly one-third of the deaths. Syphilis and rheumatism were the most prevalent of this class, the admissions by the former having amounted to 111, and by the latter to 46 per 1,000 of mean strength. The most fatal diseases of this class were those grouped under phthisis and scrofula, the ratio of deaths by them having amounted to 2·81 per 1,000.

Of the LOCAL DISEASES, those of the urinary system furnished the highest proportion of cases, but the excess was entirely due to gonorrhœa, which gave 107 out of the 122 admissions per 1,000 included in this group. Diseases of

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the cutaneous system and accidental injuries rank next in point of frequency, and the results for the latter differ little from those for the corresponding class in former years. The proportion of accidental deaths was a trifle under, and that of self-inflicted slightly above, the average of the preceding nine years; of the latter 21 were effected by fire-arms, 7 by cut-throat, 3 by drowning, 1 by poison—cyanide of potassium—and 1 by multiple injury, the man having thrown himself off the Castle Rock at Edinburgh.

The distribution of sickness and mortality at the different groups of stations, arranged as in previous Reports, is shown in the following Tables:—

	Average Strength.	Admitted into Hospital.	Died.	Average constantly Sick.
1. Seaport Towns	9,983	7,926	96	429
2. Dockyards and Arsenals	10,320	9,063	106	436
3. Camps	18,580	14,892	133	740
4. Large Manufacturing Towns ..	3,530	2,979	34	163
5. London and Windsor	5,190	3,664	43	229
6. Dublin	4,294	3,965	54	223
7. Stations of Depôt Battalions not included in preceding groups ..	4,760	4,474	51	234
8. Remaining Stations	17,107	11,834	126	557
9. Detached from their Corps ..	..	..	51	..
Total ..	73,764	58,797	694	3,011

	Ratio per 1,000 of Strength.					
	1869.			1860–68.		
	Admitted into Hospital.	Died.	Constantly Sick.	Admitted into Hospital.	Died.	Constantly Sick.
1. Seaport Towns	794	9·61	42·97	1,008	9·45	53·03
2. Dockyards and Arsenals ..	878	10·27	42·24	1,049	9·61	53·24
3. Camps	802	7·16	39·83	913	6·86	47·52
4. Large Manufacturing Towns	844	9·63	46·18	1,043	9·39	48·55
5. London and Windsor	706	8·28	44·12	862	7·54	49·99
6. Dublin	924	12·57	51·93	939	9·28	52·68
7. Stations of Depôt Battalions not included in preceding groups	940	10·71	48·53	1,036	9·01	50·48
8. Remaining Stations ..	692	7·36	32·56	849	7·79	37·84
Total, including men detached from their Corps	797	9·41	40·82	956	9·52	48·54

The admissions were lower than in 1868 at all the groups of stations except Dublin, where there was a slight increase; and the deaths also were lower except at London and Windsor, where in the preceding year the ratio had been exceptionally low.

Compared with the average of the preceding nine years the admissions show a reduction at all the stations, but the deaths were higher except at the group of "Remaining Stations." The increase, however, was more apparent than real; the number of deaths which occurred in 1869 among men detached from their corps and therefore not attributed to any group of stations, having been only 51 against an average of 94 for the preceding years.

The average proportion constantly sick was lower than in 1868 at all the groups except Dublin, and under the average of the last nine years at all of them.

The admissions and deaths by the different classes of diseases are shown in the following Tables:—

Orders	Groups of Stations	Seaports.		Dockyards and Arsenals.		Camps.		Manufacturing Towns.		London and Windsor.		Dublin.		Depôt Battalions.		Remaining Stations.		Men detached from their Corps.
	Average Strength	9,983		10,320		18,580		3,530		5,190		4,294		4,760		17,107		
	Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Died.
	I. General Diseases.																	
1	Febrile Group	553	7	715	3	721	4	138	...	213	5	200	4	234	2	614	9	2
2	Constitutional	1,630	25	1,575	43	2,906	42	837	15	1,107	16	1,256	12	894	20	2,576	32	22
	II. Local Diseases.																	
	Diseases of the—																	
1	Nervous System	113	4	169	7	239	3	36	1	28	7	38	4	62	2	162	7	5
2	Eye	140	...	155	...	343	...	52	...	46	...	87	...	94	...	266	...	...
3	Ear	31	...	57	...	55	...	8	...	7	...	18	...	30	...	65	...	...
4	Nose	...	...	6	...	7	...	...	...	...	...	...	...	4	...	2	...	...
5	Circulatory System	145	22	202	22	271	28	31	7	25	4	47	14	51	12	127	19	3
6	Absorbent ,,	89	...	106	...	214	1	30	...	87	...	107	...	72	...	187	...	...
7	Ductless Glands	...	...	...	...	2	1	...	...	...	...	...	...	...	...	2	1	...
8	Respiratory System	784	12	1,056	9	1,369	22	289	4	351	4	336	11	348	7	1,016	11	4
9	Digestive ,,	789	8	1,367	12	1,632	6	214	4	387	1	327	2	542	2	1,191	3	6
10	Urinary ,,	355	2	1,165	2	2,119	7	618	1	405	1	626	3	740	1	1,995	8	1
11	Generative ,,	122	...	121	...	282	...	45	...	50	...	69	...	75	...	202	...	...
12	Organs of Locomotion	69	1	87	...	99	1	18	...	26	...	17	...	24	1	73	1	...
13	Cellular Tissue	171	...	185	...	423	...	86	1	174	1	84	...	92	...	297	1	...
14	Cutaneous System	872	...	1,008	...	2,189	...	284	...	344	...	365	...	608	...	1,476	...	...
	III. Conditions, &c.																	
	Debility	51	...	47	1	63	...	7	...	10	...	4	...	46	...	39	...	...
	IV. Poisons	32	2	25	1	69	3	6	...	11	2	13	...	17	...	54	5	...
	V. Injuries.																	
2	Accidental injuries	959	7	1,043	1	1,865	9	326	...	389	2	370	1	518	2	1,473	17	5
3	Homicidal	1	1	...	...	1	1	...	...	...	...	...	...	2	...	1	...	...
4	Self-inflicted	3	5	1	5	7	4	1	1	2	...	...	3	2	1	...	12	3
5	Judicial	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	1
	VI. Surgical Operations	8	...	1	...	5	1	...	...	1	...	...	...	1	...	1	...	...
	No appreciable disease	9	...	23	...	11	...	3	...	1	...	1	...	18	...	14	...	...
	Total	7,926	96	9,063	106	14,892	133	2,979	34	3,664	48	3,965	54	4,474	51	11,834	126	51

Ratio per 1,000 of Mean Strength.

Orders.	Groups and Stations / Diseases.	Seaports.		Dockyards and Arsenals.		Camps.		Manufacturing Towns.		London and Windsor.		Dublin.		Depôt. Battalions.		Remaining Stations.	
		Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*																
1	Febrile Group	55·4	·70	69·3	·29	38·8	·22	39·1	...	41·0	·96	46·6	·93	49·2	·42	35·9	·53
2	Constitutional	163·3	2·51	152·6	4·17	156·4	2·26	237·1	4·25	213·3	3·08	292·5	2·79	187·8	4·20	150·6	1·87
	II. *Local Diseases.* Diseases of the—																
1	Nervous System	11·3	·40	16·4	·68	12·9	·16	10·2	·28	5·4	1·35	8·8	·93	13·0	·42	9·5	·41
2	Eye	14·0	...	15·0	...	18·5	...	14·7	...	8·9	...	20·3	...	19·8	...	15·5	...
3	Ear	3·1	...	5·5	...	3·0	....	2·3	...	1·3	...	4·2	...	6·3	...	3·3	...
4	Nose	...	...	·6	...	·4	...	...	...	...	...	...	...	·8	...	·1	...
5	Circulatory System	14·5	2·20	19·6	2·13	14·6	1·51	3·8	1·98	4·8	·77	10·9	3·26	10·7	2·52	7·4	1·11
6	Absorbent ,,	8·9	...	10·3	...	11·5	·05	8·5	...	16·8	...	24·9	...	15·1	...	10·9	...
7	Ductless Glands	...	...	...	...	·1	·05	...	...	...	...	...	...	...	...	·1	·06
8	Respiratory System	78·6	1·20	102·2	·87	73·7	1·19	67·7	1·14	67·6	·77	78·2	2·56	73·1	1·47	59·4	·64
9	Digestive ,,	79·1	·80	132·4	1·16	87·8	·32	60·6	1·14	74·6	·19	76·2	·47	113·9	·42	69·6	·17
10	Urinary ,,	136·7	·20	112·9	·19	114·0	·38	175·1	·28	78·0	·19	145·8	·70	155·5	·21	116·5	·47
11	Generative ,,	12·2	...	11·7	...	15·2	...	12·7	...	9·6	...	16·1	...	15·8	...	11·8	...
12	Organs of Locomotion	6·9	·10	3·5	...	5·3	·05	5·1	...	5·0	...	3·9	...	5·0	·21	4·3	·06
13	Cellular Tissue	17·1	...	17·9	...	22·8	...	24·3	·28	33·5	·19	19·6	...	19·3	...	17·4	·06
14	Cutaneous System	87·4	...	97·7	...	117·8	...	80·5	...	66·3	...	85·0	...	127·7	...	86·3	...
	III. *Conditions, &c.*																
	Debility	5·1	...	4·7	·10	3·4	...	2·0	...	1·9	...	·9	...	9·7	...	2·3	...
	IV. *Poisons*	3·2	·20	2·4	·10	3·7	·16	1·7	...	2·1	·39	3·0	...	3·6	...	3·2	·29
	V. *Injuries.*																
2	Accidental	96·1	·70	101·1	·10	100·4	·49	92·4	...	75·0	·39	86·2	·23	108·8	·42	86·1	·99
3	Homicidal	·1	·10	....	...	·4	·05	...	...	...	...	...	...	·4	...	·1	...
4	Self-inflicted	·3	·50	·1	·48		·22	·3	·28	·4	...	...	·70	·4	·21	...	·70
5	Judicial	...	...	...	...	...	...	...	...	...	...	...	...	...	·21	·1	...
	VI. *Surgical Operations*	·8	...	·1	...	·2	·05	...	...	·2	...	...	...	·2	...	·1	...
	No appreciable disease	·9	...	2·2	...	·6	...	·8	...	·2	...	·2	...	3·8	...	·8	...
	Total	794·0	9·61	878·2	10·27	801·5	7·16	843·9	9·63	705·9	8·28	923·3	12·57	939·9	10·71	691·8	7·36

GENERAL DISEASES. The febrile subdivision was most prevalent in the Dockyards and Arsenals, and the Constitutional in Dublin; the ratio of both was lowest at the "Remaining Stations." The following Table shows the proportion of admissions and deaths by each of the principal diseases in the different groups of stations:— *United Kingdom.*

General Diseases.		Annual Ratio per 1,000 of Mean Strength.							
		Seaport Towns.	Dockyards and Arsenals.	Camps.	Large Manufacturing Towns.	London and Windsor.	Dublin.	Depôt Battalion Stations.	Remaining Stations.
Febrile.									
Eruptive Fevers ..	Admitted	2·9	5·7	2·6	4·2	4·6	3·7	8·8	1·0
	Died ..	..	·10	..	..	·19	..	·21	..
Continued Fevers ..	Admitted	30·1	13·5	21·0	22·9	16·4	24·6	14·9	17·4
	Died ..	·50	·19	·22	..	·76	·70	..	·53
Paroxysmal Fevers ..	Admitted	13·4	26·5	4·8	3·7	1·0	5·1	12·6	4·3
	Died ..	..	..	..	..	..	·23	..	..
Influenza ..	Admitted	5·9	20·3	8·1	6·3	16·6	8·6	10·3	10·9
	Died ..	..	..	..	..	..	..	..	..
Erysipelas..	Admitted	1·9	2·2	1·2	1·7	1·1	1·2	1·5	1·5
	Died ..	..	..	..	..	..	..	..	..
Other Febrile Affections ..	Admitted	1·2	1·9	1·1	..	1·4	3·3	1·1	·7
	Died ..	·20	..	..	..	..	..	..	..
Constitutional.									
Rheumatism	Admitted	51·1	64·5	45·4	36·8	33·9	46·6	54·4	36·3
	Died ..	·10	·19	..	·28	·19	..	·21	·06
Syphilis ..	Admitted	96·9	68·1	96·8	183·9	164·0	229·2	110·9	99·2
	Died ..	..	..	·11	·28	·19	..	·21	·06
Scrofula, Phthisis,&c.	Admitted	12·2	17·7	11·5	13·6	13·7	14·7	20·4	12·6
	Died ..	2·20	3·88	2·10	3·68	2·51	2·56	3·99	1·75
Scurvy and Purpura ..	Admitted	·7	·6	·3	..	..	..	·2	·5
	Died ..	..	..	..	..	..	..	..	..
Anæmia ..	Admitted	1·9	1·1	1·8	·9	·6	1·2	1·1	1·0
	Died ..	..	..	..	..	..	..	..	..
Other Constitutional Affections.	Admitted	·5	·7	·6	2·0	1·1	·9	·8	1·1
	Died ..	·20	·10	·05	..	·19	·23	..	..

Eruptive Fevers did not prevail to a great extent at any of the groups of stations. The ratio of admissions at the Dockyards and Arsenals and the Depôt Battalion Stations was raised above the average by some cases of vaccination which it was considered necessary to take into hospital at Woolwich and Chatham, and at Canterbury and Maidstone. Only three deaths were returned, all by scarlet fever; they occurred at Windsor, Pembroke Dock, and Stirling.

Continued Fevers were most prevalent at the Seaport Towns and least at the Dockyards and Arsenals. At all of the groups except Dublin the ratio of cases was rather higher than in 1868, but this difference may probably have been the result of the change in the nomenclature; many cases being returned as *febricula* which formerly were included under the term of *ebriositas* (intemperance). Only 12 cases were returned as typhus, with 4 deaths; 41 cases and 13 deaths as enteric fever; 1 as relapsing; and 5 with 4 deaths as

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cerebro-spinal fever; 700 cases and 7 deaths as simple continued fever, and 711 cases as febricula. The case of relapsing fever occurred at Pembroke Dock; two of the cases of cerebro-spinal fever occurred at Portsmouth, and one at Aldershot, Dover, and Kilkenny respectively, the last being the only one which recovered. Enteric fever did not prevail epidemically at any station, the highest number of admissions having been 6 among the Guards at London and Windsor, and of these three died. At no other station was there more than one death by this form of fever. Three of the seven deaths by continued fever occurred at Dublin.

Paroxysmal Fevers, though less prevalent than in 1868, were considerably above the average at the Seaport Towns and the Dockyards and Arsenals. The excess in the former was most marked at Portsmouth, and in the latter at Chatham, and was due to the circumstance of the garrisons being chiefly composed of corps recently returned from India, where the men had contracted the liability to that form of fever.

Influenza was more prevalent at the Dockyards and Arsenals and at London and Windsor than at any of the other groups of stations; the excess at the former was chiefly at Woolwich in the last quarter of the year, and at the latter in the 1st Battalion Coldstream Guards in London, which furnished more than half the total admissions by this disease in the Household Brigade.

Erysipelas did not prevail to any extent among the troops, and there was no fatal case of it during the year.

Rheumatism did not differ greatly from the results of the preceding year. There was a slight increase at the Dockyards and Arsenals, and a decrease in London and Windsor.

Syphilis gave rise to a very high proportion of admissions among the troops in Dublin, and also in the large Manufacturing Towns and in London and Windsor, while the proportion was lowest at the Dockyards and Arsenals. The comparative exemption of the latter group was probably due to the operation of the Contagious Diseases Act at Woolwich and Chatham. The Seaport Towns and Camps had the next lowest proportion, probably from the same cause, the Act having been in force at Devonport and Portsmouth in the former, and at Aldershot, Shorncliffe, and Colchester in the latter. The proportion of cases of primary and secondary syphilis repectively was as 3 to 1.

The following Table shows the relative prevalence of primary venereal sores at the principal stations of troops. The proportion of cases in 1867 and 1868 has been added to facilitate comparison* :—

* *See* also No. VI of Appendix, at p. 310 of this volume.

Stations.	Admissions into Hospital per 1,000 of Mean Strength for Primary Venereal Sores in		
	1867.	1868.	1869.
Devonport and Plymouth	76	66	74
Portsmouth	116	86	62
Chatham and Sheerness	71	63	41
Shorncliffe	42	77	60
Woolwich	88	46	52
Aldershot	81	77	63
Colchester	145	182	85
Windsor	58	136	93
Isle of Wight	59	103	129
Winchester	52	104	101
Canterbury	119	114	45
Dover	132	111	80
London	163	148	144
Warley	74	92	61
Pembroke Dock	28	35	51
Manchester	177	115	160
Preston	87	87	172
Edinburgh	63	46	60
Cork	72	61	73
Fermoy	70	47	116
Limerick	117	114	54
Curragh	104	85	88
Dublin	129	139	180
Belfast	89	56	52

At the first eight stations the Contagious Diseases Act was in operation during the whole year, except at Colchester, where it began on the 22nd January; at six of these there was a decrease in primary sores, and at two an increase compared with the results for the preceding year. At the 16 stations where the Act was not in operation, or was so only for a short period,—as at Cork and the Curragh,—there was an increase in primary sores at 9 and a decrease at 7. At Dublin, Preston, and Manchester the prevalence of this form of venereal disease was excessive. At the Isle of Wight, Fermoy, and Winchester also the admissions exceeded 10 per cent. of the average strength.

Scrofula, Phthisis, &c. This important group, which closely corresponds with the class of tubercular diseases in former Reports, has furnished results differing very little from those of 1868. There was a reduction in the admissions and deaths in the Manufacturing Towns, and an increase in London and Windsor; but the former had been exceptionally high and the latter exceptionally low in the preceding year. The Depôt Battalions had the highest ratio of cases and deaths, but this was probably due to the number of men serving in them whose general health has been impaired by disease contracted on foreign service.

The other groups of diseases furnish so small a proportion of cases as not to call for any special notice.

Local Diseases.—The admissions under *diseases of the eye* correspond very closely in all the groups with the proportion admitted in 1868 under the head of ophthalmia. They do not appear to have prevailed to an unusual extent at any of the groups of stations; Dublin furnished the highest, and the Household Brigade at London and Windsor the lowest ratio of admissions.

Diseases of the Urinary System furnished the highest proportion of admissions of the groups of local diseases; but this was due to gonorrhœa being included in it. London and Windsor had the lowest, and the Manufacturing Towns the highest proportion of admissions.

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Diseases of the Cutaneous System rank next in point of frequency, the Depôt Battalion Stations having the highest proportion, the excess being chiefly in cases of ulcers, boils and itch.

Diseases of the Digestive System were considerably above the average at the Dockyards and Arsenals, from the prevalence of tonsillitis, dyspepsia, and diarrhœa at Woolwich, and of hepatitis at Chatham, and also at Woolwich; the latter diseases were probably the result of previous tropical service of the men. At the Depôt Battalion stations the admissions were also above the average from the same diseases.

Diseases of the Respiratory System also were most prevalent at the Dockyards and Arsenals, bronchitis at Woolwich and Chatham being the cause of the excess. The proportion of cases at the other groups of stations did not vary greatly.

Diseases of the Circulatory System, although the cause of only 12 admissions per 1,000 of the strength, are an important class, from the amount of mortality and invaliding to which they give rise. They were the cause of nearly one-fifth of the mortality. The total deaths by them amounted to 131, of which 60 were by disease of the heart—chiefly valve disease—67 by disease of the arteries—mostly aneurism—and 4 by inflammation of the pericardium. The troops in London and Windsor had a very low rate of mortality by these diseases, but this may possibly have been an accidental irregularity consequent on the small numbers included in the observations.

Poisons.—The admissions by this class, 227 in number, with the exception of one case of accidental poisoning by oxalic acid, were all under the head of delirium tremens. They amounted to 3 per 1,000 of mean strength, and ranged between 1·7 in the Manufacturing Towns, and 3·6 in the Depôt Battalion Stations. Nine of the cases died; and there were also four deaths recorded from the direct effects of drunkenness.

Injuries.—The admissions by accidents did not differ much from the results of the preceding year. There was an increase in the proportion at Dublin, but in 1868 the ratio had been unusually low.

Under the head of *Judicial Injuries* one admission and two deaths are recorded; the former was the case of a soldier on whom corporal punishment was inflicted in prison by order of the visitors for some breach of prison discipline, and who was sent to the garrison hospital for treatment; the two deaths were those of soldiers executed for murder.

Surgical Operations.—Under this head 17 cases were returned. Of these one was an amputation at the shoulder; one, which proved fatal, an amputation of thigh; three were amputations at the ankle joint; ten amputations of fingers or toes; one was the removal of a testicle; and one circumcision. They all did well, except the amputation of the thigh.

The distribution of the sickness and mortality among the different arms of the Service is shown in the following Table, from which, however, are excluded all corps which served in the United Kingdom during only a part of the year—

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	Average Strength.	Admitted into Hospital.	Died in and out of Hospital.	Discharged as Invalids.	Annual Ratio per 1,000 of Strength.			1859-68. Annual Ratio per 1,000.		1860–8 Ratio per 1,000.
					Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Household Cavalry	1,216	650	10	28	534	8·22	23·03	610	7·72	15·24
Dragoon Guards & Dragoons ..	7,923	5,831	60	233	736	7·57	29·40	885	6·58	29·38
Royal Artillery ..	7,912	6,275	74	344	793	9·35	43·47	988	7·95	* ..
Royal Engineers..	2,821	..	20	64	..	7·09	22·69	..	6·57	..
Military Train ..	1,644	853	14	78	519	8·52	47·43	982	7·23	23·19
Foot Guards ..	5,642	3,617	45	147	641	7·98	26·05	817	8·06	27·80
Infantry Regts. ..	31,541	23,092	232	964	732	7·36	30·56	830	7·95	28·49
Army Hosp. Corps	733	..	14	5	..	19·09	6·82	..	15·14	..
Commist. Staff „	441	..	3	5	..	6·80	11·34	..	11·36	21·05
Depôt Brig., R.A..	2,398	2,466	16	82	1,028	6·67	34·19	1,098	10·32	*25·17
Coast Brig., R.A..	1,665	..	22	20	..	13·21	12·01	..	18·18	8·59
Depôt Battalions.	10,686	9,735	132	501	911	12·35	46·88	992	11·77	39·42

Compared with the results for 1868, there has been a reduction in the ratio of admissions in all the arms except the Depôt Brigade Royal Artillery, which shows a slight increase, and which, as in that year, has furnished the highest proportion of cases. There has also been a reduction in the deaths except in the Royal Engineers and Foot Guards, which in the preceding year had been exceptionally low, and in the Army Hospital Corps, which had the highest ratio of deaths. The excess in that corps during the past year may perhaps be in some degree the result of small numbers under observation, and also of the age of the men composing it being generally higher than in any of the other arms except the Coast Brigade Royal Artillery. The admissions in all the arms were under the average of the last ten years, but the deaths were above it in the Cavalry, Ordnance, Military Train, and Depôt Battalions.

On adding to the different arms one-half of the numbers placed on the pension list, and the deaths which occurred among these men from the date of being pensioned till the 31st December, on the principle explained in the previous Report, the mortality is found to have been as follows:—

	1869.			1860–68.
	Average Strength corrected as above.	Deaths of Soldiers and Pensioners.	Ratio of Deaths per 1,000 of Strength.	Ratio of Deaths of Soldiers and Pensioners per 1,000 of Strength.
Household Cavalry	1,244	15	12·06	9·40
Cavalry of the Line	8,067	67	8·31	7·53
Royal Artillery	8,119	82	10·08	8·83
Military Train	1,687	17	10·10	7·95
Foot Guards	5,740	61	10·63	10·36
Infantry Regiments	32,181	278	8·64	9·28

* Prior to 1864 it was found impossible to separate the invalids of the Brigades serving at home from those of the Depôt Brigades. The ratio discharged as invalids in 1869, calculated in the same manner as for the preceding years, would be 37·41 per 1,000 of the strength.

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The mortality of the troops when thus increased by the deaths among the pensioners shortly after their discharge, has been above the average of the preceding nine years in all the arms except the Infantry Regiments. We are unable to obtain the requisite information respecting the Depôts and the Administrative Corps, and have been obliged, therefore, to confine this comparison to the arms included in the preceding Table. Calculated in this manner, the Household Cavalry and Foot Guards have furnished the highest ratio of mortality, not only in 1869, but on the average of the nine preceding years, and the Cavalry of the Line has given the lowest ratio.

The admissions and deaths in each arm of the Service by the various classes of diseases are shown in the following Table, framed from Abstract No. 1 in the Appendix:—

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Orders.	Diseases.	Household Cavalry.			Cavalry.			Royal Artillery.			Military Train.			Foot Guards.			Infantry Regiments.			Depôt Brigade Royal Artillery.			Infantry Depôt Battalions.			Royal Engineers.	Coast Brigade, R. A.		Army Hospital Corps.		Commissariat Staff Corps.	
		Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Died.	Died.	Invalided.	Died.	Invalided.	Died.	Invalided.
	Strength	1,216			7,923			7,912			1,644			5,642			31,541			2,398			10,686			2,821	1,665		733		441	
	I. *General Diseases.*																															
1	Febrile Group.. ..	32	1	..	217	2	24	296	4	..	70	2	8	216	5	13	1,423	12	109	214	3	10	520	5	44	1	1	4	3	1	..	..
2	Constitutional ..	114	6	15	1,334	13	64	1,231	22	94	188	1	80	1,231	17	70	5,001	74	346	406	6	22	1,865	54	180	10	11	1	3	..	..	..
	II. *Local Diseases.*																															
	Diseases of the—																															
1	Nervous System ..	4	1	..	90	4	24	75	2	31	20	1	8	33	7	13	298	12	109	39	3	10	139	4	44	1	1	4	3	1	..	..
2	Eye	3	..	..	102	..	4	94	..	13	7	..	2	51	..	3	534	..	46	28	..	2	221	..	22	..	..	1	..	..	..	..
3	Ear	..	..	..	14	..	4	28	..	7	6	..	2	7	..	..	105	3	18	11	..	1	55	..	4	..	..	..	..	..	..	..
4	Nose	..	..	..	2	..	..	2	..	..	..	..	..	..	..	..	7	..	..	1	..	..	6	..	..	..	..	..	1	2	..	2	..
5	Circulatory System ..	3	..	2	48	13	23	110	25	57	22	3	13	30	6	17	389	37	141	40	1	14	136	24	80	3	4	..	3	..	2	..
6	Absorbent ,, ..	9	..	..	97	..	..	90	1	..	15	..	..	88	..	..	372	1	1	17	..	..	129	..	1	..	..	..	..	..	..	..	..
7	Ductless Glands ,, ..	..	..	..	1	..	..	1	..	..	..	..	..	1	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
8	Respiratory System ..	81	..	1	463	7	20	609	5	24	83	3	10	288	5	17	2,177	35	68	213	2	2	969	18	42	1	1	4	1	..	1	..
9	Digestive ,, ..	99	..	2	534	3	24	756	3	47	90	1	3	345	1	3	2,569	11	82	449	2	10	1,139	10	45	1	1	1	2	..	..	..
10	Urinary ,, ..	66	..	1	804	4	9	966	1	4	105	1	2	418	..	5	3,761	7	23	381	..	2	1,533	4	3	..	..	1	..	..	..	..
11	Generative ,, ..	7	..	..	•111	..	•7	94	..	9	21	..	1	39	..	..	348	..	5	21	..	..	153	..	3	..	..	..	..	..	..	..
12	Organs of Locomotion	3	..	1	49	..	9	89	2	12	6	..	4	43	..	4	130	1	22	11	..	5	63	1	15	..	..	1	..	..	..	..
13	Cellular Tissue ..	33	..	..	•70	2	2	147	..	2	12	1	1	150	..	2	552	..	3	44	..	..	238	1	1	..	..	..	..	..	..	..
14	Cutaneous System ..	84	..	1	847	..	11	768	..	10	101	..	2	302	..	1	2,805	..	21	270	..	1	1,281	..	12	..	..	..	..	..	..	..
	III. *Conditions, &c.*																															
	Debility	4	..	3	18	..	17	24	..	17	1	..	..	6	..	4	115	..	39	9	1	10	83	..	21	..	..	..	..	..	..	..
	IV. *Poisons* ..	1	1	..	19	1	..	23	..	..	1	..	..	14	1	2	83	7	..	4	..	..	46	..	..	1	1	..	..	..	..	..	..
	V. *Injuries.*																															
2	Accidental	107	1	1	893	6	11	900	5	16	104	..	..	352	2	2	2,591	21	39	308	1	3	947	6	10	1	2	..	..	..	..	..
3	Homicidal	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1	..	..	..	..	2	..	..	1	..	..	..	..	..	..
4	Self-inflicted ..	..	..	..	2	5	..	1	3	..	..	..	..	2	..	2	6	11	..	..	..	..	4	6	..	..	1	..	..	..	..	..
5	Judicial	..	..	..	..	..	1	2	..	1	1	..	..	1	..	1	6	1	2	..	..	..	3	..	2	..	..	..	..	..	..	..
	VI. *Surg. Operations*	..	..	..	..	..	..	7	..	..	..	..	..	1	..	..	25	..	..	..	..	..	34	..	..	..	..	..	..	..	..	..	..
	No Appreciable Disease	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	Total	650	10	28	5,881	60	283	6,276	74	344	868	14	78	3,617	45	147	23,092	232	964	2,466	16	82	9,735	132	501	20	22	20	14	5	3	6

Ratio per 1,000 of Mean Strength.

Order	Diseases.	Household Cavalry.			Cavalry.			Royal Artillery.			Military Train.			Foot Guards.			Infantry Regiments.			Depôt Brigade Royal Artillery.			Depôt Battalions.			Royal Engineers.	Coast Brigade, R.A.		Army Hospital Corps.		Commissariat Staff Corps	
	Strength	1,216			7,923			7,912			1,644			5,642			31,541			2,398			10,686			2,821	1,665		733		441	
		Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Died.	Died.	Invalided.	Died.	Invalided.	Died.	Invalided.
	I. *General Diseases.*																															
1	Febrile	26·3	·82	..	27·4	·25	..	37·7	·51	..	42·6	1·22	..	38·3	·89	..	45·1	·38	..	89·2	..	..	48·7	·47	·18	·35	·60	..	..	..	..	..
2	Constitutional ...	93·8	4·94	12.34	168·4	1·64	8·46	155·6	2·77	11·89	114·3	·61	18·25	218·2	3·01	12·41	158·6	2·85	10·97	169·3	2·50	9·17	174·5	5·05	17·78	3·55	6·61	4·81	4·09	4·09	..	6·80
	II. *Local Diseases.* Diseases of the—																															
1	Nervous System ..	3·3	·82	...	11·4	·51	3·03	9·5	·25	3·91	12·2	·61	4·87	5·9	1·24	2·31	9·5	·38	3·46	16·3	1·25	4·17	17·7	·37	4·11	·35	·60	2·49	4·09	1·36	..	..
2	Eye	2·5	..	·82	12·9	..	·50	11·9	..	1·64	4·3	..	1·22	9·0	..	..	16·9	..	1·46	11·7	..	·83	20·7	..	2·05	..	..	·60	..	..	..	..
3	Ear	..	..	..	1·8	..	·50	3·5	..	·88	3·6	..	1·22	1·2	..	·53	3·3	..	·57	4·6	..	·42	5·1	..	·36	..	..	..	..	..	..	..
4	Nose	..	..	..	..	..	..	·2	..	..	..	..	..	..	..	..	·2	..	..	·4	..	..	·6	..	..	..	..	..	..	..	..	..
5	Circulatory System ...	2·5	..	1·65	5·4	1·64	2·90	13·9	3·16	7·20	13·4	1·82	7·90	5·3	1·06	3·01	12·3	1·17	4·47	16·7	·42	5·84	17·8	2·25	7·48	1·07	2·40	..	4·09	1·36	4·53	4·54
6	Absorbent ,, ...	7·4	..	..	12·2	..	..	11·4	·13	..	9·1	..	..	15·4	..	..	11·8	..	·03	7·1	..	..	12·1	..	·09	..	..	..	..	..	..	..
7	Ductless Glands ...	..	..	..	..	..	..	·1	·13	..	..	..	..	·2	..	·18	..	·03	..	..	..	..	·1	..	..	..	..	..	..	..	..	..
8	Respiratory System...	66·6	..	·82	58·4	·88	2·52	77·0	·63	3·03	50·5	1·82	6·08	51·0	·89	3·01	69·0	1·11	2·16	88·8	·83	·83	92·5	1·69	3·93	·35	..	2·49	1·36	..	..	..
9	Digestive ,, ...	81·4	..	1·65	69·9	·38	3·03	95·6	·38	5·94	54·7	·61	1·84	61·1	·18	·53	75·1	·35	2·60	187·2	·83	4·17	106·5	·94	4·21	·35	..	·60	2·72	..	2·27	..
10	Urinary ,, ...	54·3	..	·82	101·5	·50	1·14	24·6	·13	·51	63·9	·61	1·21	74·1	·18	·89	118·9	·23	·73	158·9	..	..	148·1	·37	·74	..	·60	·60	2·73	..	..	..
11	Generative ,, ...	5·7	..	..	14·0	..	·88	11·9	..	1·14	12·8	..	·60	6·9	..	..	11·0	..	·16	8·8	..	·83	14·3	..	·27	..	..	..	..	..	..	..
12	Organs of Locomotion	2·5	..	·82	6·2	..	1·13	4·9	·25	1·52	3·6	..	2·43	7·6	..	·71	4·1	·03	·70	4·6	..	2·09	5·9	·09	1·40	..	..	·60	..	..	..	..
13	Cellular Tissue ...	27·1	..	..	21·4	·25	·25	18·6	..	·25	7·3	·61	·60	26·6	..	·35	17·5	..	·09	18·3	..	..	22·3	..	·09	..	..	..	..	..	..	..
14	Cutaneous System ...	69·0	..	·82	106·9	..	1·39	95·8	..	1·26	61·4	..	1·21	53·5	..	·18	89·0	..	·66	112·6	..	·42	119·9	..	1·12	..	..	..	..	..	..	..
	III. *Conditions, &c.*																															
	Debility	3·3	..	2·47	2·3	..	2·15	3·9	..	2·15	·6	..	..	1·1	..	·71	3·7	..	1·24	3·8	·42	4·17	7·8	..	1·96	..	..	..	..	..	..	..
	IV. *Poisons* ...	·8	·82	..	2·4	·13	..	2·9	..	..	·6	..	..	2·5	·18	·35	2·6	·22	..	1·7	..	..	4·3	..	..	..	·60	..	..	..	..	..
	V. *Injuries.*																															
2	Accidental	88·0	·82	·8	112·7	·76	1·39	113·8	·63	2·02	63·3	..	..	62·4	·35	·35	82·2	·67	1·23	128·4	·42	1·25	88·6	·56	·93	·35	1·20	..	..	..	..	..
3	Homicidal	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·1	·03	..	..	..	..	·2	..	..	·35	..	..	..	..	..	..
4	Self-Inflicted... ...	..	..	..	·2	·63	..	·1	·38	..	..	..	..	·4	..	·35	·2	·35	..	..	..	..	·3	·56	..	..	·60	..	..	..	..	..
5	Judicial	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	·2	·06	..	..	..	..	..	..	..	..	..	..	..	..	..	..
	VI. *Surg. Operations*	..	..	..	..	..	·13	1·2	..	·13	·6	·61	..	·2	..	·18	·2	..	·03	..	..	..	·2	..	·18	..	..	..	..	..	..	..
	No appreciable disease	..	..	..	·5	..	..	·9	..	...	..	..	..	·2	..	..	·8	..	..	..	..	..	3·2	..	..	..	..	..	..	..	..	..
	Total	534·5	8·22	23·03	735·9	7·57	29·40	793·1	9·35	43·47	518·8	8·52	47·48	641·1	7·98	26·05	732·1	7·36	30·56	1028·4	6·67	34·19	911·0	12·35	46·88	7·07	13·21	12·01	19·09	6·81	6·80	11·34

GENERAL DISEASES.—The admissions and deaths by the principal diseases in each of the subdivisions of this class were as follows :—

General Diseases.		Annual Ratio per 1,000 of Mean Strength.							
		Household Cavalry.	Dragoon Guards and Dragoons.	Royal Artillery.	Military Train.	Foot Guards.	Infantry Regiments.	Depôt Brigade, Royal Artillery.	Depôt Battalions.
Febrile—									
Eruptive Fevers	Admitted	4·9	·9	1·9	..	3·4	2·4	9·6	8·5
	Died	·82	..	..	..	..	..	..	·19
Continued Fevers	Admitted	7·4	13·3	17·5	15·2	18·8	21·8	7·9	17·5
	Died	..	·25	·51	1·22	·89	·32	..	·28
Paroxysmal Fevers	Admitted	..	2·1	8·6	1·8	·9	8·2	11·3	16·8
	Died	..	..	..	..	..	·03	..	..
Influenza	Admitted	11·5	9·2	7·7	24·4	13·6	10·4	59·2	2·3
	Died	..	..	..	..	..	..	..	..
Erysipelas	Admitted	·8	1·4	1·6	1·2	·7	1·2	1·2	1·7
	Died	..	..	..	..	..	..	..	..
Other Febrile Diseases	Admitted	1·7	·5	·4	..	·9	1·1	..	1·8
	Died	..	..	..	..	..	·03	..	..
Constitutional—									
Rheumatism	Admitted	40·3	43·0	50·8	47·4	27·8	39·8	66·7	54·6
	Died	..	..	·13	..	·18	·03	..	·09
Syphilis	Admitted	37·9	114·7	91·1	57·2	176·0	103·3	90·0	97·2
	Died	..	..	..	..	·18	·06	..	·19
Scrofula, Phthisis, &c.	Admitted	14·8	9·5	10·9	8·5	11·7	12·5	12·5	20·7
	Died	4·93	1·64	2·65	·61	2·48	2·09	2·50	4·77
Scurvy and Purpura..	Admitted	..	·3	·4	..	..	·3	·8	..
	Died	..	..	..	..	..	..	..	..
Anæmia	Admitted	..	·4	1·5	·6	1·6	1·7	·8	1·7
	Died	..	..	..	..	..	..	..	..
Other Constitutional Diseases	Admitted	·8	·5	·9	·6	1·0	1·0	·4	·3
	Died	..	..	..	..	·18	·16	..	..

Eruptive Fevers were less prevalent than in 1868 in all the arms except the Foot Guards, in which the proportion was doubled from the occurrence of a number of cases of measles in the Scots Fusilier Guards quartered in London, and the Depôt Brigade Royal Artillery and Depôt Battalions, in which the increase was entirely due to the admission of a number of men under the head of cow-pox ; in the Depôt Brigade all the cases but two, and in the Depôt Battalions nearly half the cases, were from this cause. Only three deaths occurred, all from scarlet fever, one in the Household Cavalry, and two in the Depôt Battalions.

Continued Fevers were rather more prevalent than in 1868 in all the arms except the Foot Guards and the Depôt Brigade Royal Artillery ; the increase, however, is probably due to the change in the nomenclature and classification, as under *febricula* are now included a proportion of the cases formerly returned under the head of intemperance (*ebriositas*). The decrease in the Foot Guards was merely the abatement of the excess which occurred in the preceding year, the amount in 1869 having differed slightly from that usual in the Guards. In the Depôt Brigade Royal Artillery the reduction appears to have been attended with a marked increase in the cases returned as influenza,

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the two combined furnishing a higher ratio of admissions than in any of the other arms. The mortality by this group has been very low.

Paroxysmal Fevers did not prevail to any great extent. As might have been expected, the Royal Artillery and its Depôt Brigade, and the Infantry Regiments and Depôt Battalions were the arms in which the highest proportion of cases occurred. The 21st Brigade Royal Artillery, and the 27th, 34th, and 46th Regiments, all of them recently returned from India, furnished much the greatest number of cases. In the Depôt Battalions the excess was in the 1st, 2nd, and 3rd, which were composed principally of Depôts of which the Corps were serving in India.

Influenza did not prevail generally as an epidemic among the troops during the year. The only Corps which returned any considerable number of cases were the Military Train at Aldershot, the 6th Dragoon Guards, the 6th Dragoons, the 7th Brigade Royal Artillery, the 1st and 2nd Battalions Coldstream Guards, and the 2nd Battalion 9th Regiment; but in them the disease does not appear to have prevailed epidemically.

Rheumatism did not differ materially from the results of previous years. The admissions in the Guards were below the average, while there was an excess in the Depôt Brigade Royal Artillery and the Depôt Battalions, a result probably of the larger proportion of old soldiers in these arms.

Syphilis. With the exception of the Household Cavalry, which has always shown a marked exemption from venereal diseases compared with the other arms, the Military Train had the lowest ratio of admissions by syphilis. This was probably owing to upwards of four-fifths of the Corps being quartered at stations where the Contagious Diseases Act was in full operation. The highest ratio of admissions was in the Foot Guards, the excess occurring chiefly in the 1st Battalion Coldstream and 3rd Battalion Grenadier Guards, while the proportion in the Scots Fusilier Guards did not exceed half that of either of the other two regiments. In the Cavalry the 4th Dragoon Guards at Brighton and Sheffield; in the Artillery the 11th Brigade, occupying a number of Stations; in the Infantry the 2nd Battalion 4th Regiment at Dublin, Chester, and Weedon; and in the Depôt Battalions, the 9th at Preston, had the highest proportion of cases. In the 1st Dragoons at Dublin and Cahir, the 1st Battalion 17th Regiment at Newry and Dublin, the 65th at Dublin, the Curragh, and Fermoy, the 100th at Manchester and Glasgow and Paisley, and the 5th Depôt Battalion at Parkhurst, the proportion of cases was greatly above the average.

Scrofula, Phthisis, &c.—The proportion of admissions and deaths did not differ materially from the results shown in the preceding year under the class of tubercular diseases. The high ratio of mortality in the Household Cavalry, and the low ratio in the Military Train are probably irregularities arising from the small numbers under observation. The ratio of deaths in the Foot Guards, which was unusually low in 1868, has risen to its usual amount. But in addition to the deaths there was a heavy loss by invaliding, which from the nature of the diseases, it may be fairly presumed would have caused a considerable increase of the mortality had the men not been discharged. We subjoin a statement of the loss by death and invaliding in each arm by this important group of diseases:—

	Loss per 1,000 by		
	Death.	Invaliding.	Death and Invaliding.
Household Cavalry	4·93	11·51	16·44
Cavalry of Line	1·64	4·54	6·18
Royal Artillery	2·53	5·81	8·34
Military Train	61	6·69	7·30
Foot Guards	2·66	10·28	12·94
Infantry Regiments	2·66	5·45	7·51
Depôt Brigade, Royal Artillery	2·50	6·25	8·75
„ Battalions	4·77	9·45	14·22

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This shows the heaviest loss to have fallen on the Household Cavalry, the Depôt Battalions, and the Foot Guards. In the latter it was more than double that of Cavalry of the Line, and also much above that of Infantry Regiments and the Royal Artillery.

Local Diseases.—Diseases of the nervous system were not a source of much sickness or mortality in any of the arms. The Household Cavalry and Foot Guards had the lowest ratio of admissions, but the deaths in the latter were slightly above the other arms. The admissions in the Depôt Brigade Royal Artillery, and Depôt Battalions, were above the average chiefly from cases of epilepsy and neuralgia. The 2nd Battalion at Chatham returned 25 cases under the latter head; no explanation is given by the Medical Officer in charge to account for the great excess of these cases in the Battalion.

Diseases of the Eyes have not prevailed to any extent, in any of the arms. Their amount has not differed much from that of ophthalmia in the preceding year. The 2nd Battalion 15th Regiment had the highest proportion of cases, but in it the total admissions amounted only to 31. The Cavalry Depôt and 10th Depôt Battalion had also a slight excess of cases.

Diseases of the Circulatory System furnished the highest ratio of admissions in the Depôt Battalions and Depôt Brigade Royal Artillery. But omitting these, they were most prevalent and more fatal in the Royal Artillery. Valve disease and hypertrophy of the heart and palpitation were the most prevalent forms of disease. The excess in the Artillery may probably be to some extent a result of the duties of the men, and in the Depôt Brigade and Depôt Battalions it may be a a consequence of tropical service, of age, and of the habits of the old soldier. Aneurism has been the most frequent cause of death in this class, and has furnished a large proportion of those which occurred suddenly and out of hospital. The Artillery had the highest proportion of deaths from this cause.

Diseases of the Respiratory System were more prevalent in the Depôt Brigade and Depôt Battalions than in any of the other arms, bronchitis being the principal disease. The 10th Battalion at Shorncliffe had the highest proportion of cases. Pneumonia was the chief cause of mortality in this class, 57 deaths having occurred in 410 cases, and of these 12 deaths were in the Depôt Battalions.

Diseases of the Digestive System were also considerably in excess in the Depôt Brigade and Depôt Battalions; and in the Royal Artillery tonsillitis, dyspepsia, and diarrhœa were the most prevalent diseases; and in the Depôt Battalions hepatitis was high, a result in all probability of the previous service of the men.

Diseases of the Urinary System were the most prevalent of all the classes of local diseases, the excess being entirely due to Gonorrhœa. The Depôt Brigade and Depôt Battalions had the highest proportion of admissions, a result of the large number of recruits in them. Bright's disease was the most fatal in this class, 38 admissions having been recorded, of which 13 terminated fatally: it was not confined to any of the arms.

Diseases of the Cutaneous System were a cause of considerable inefficiency, particularly in the Depôt Brigade and Battalions, and in the Cavalry; in the latter, ulcers and boils, probably the result of the duty, were the chief affections, and in the former itch and ulcers predominated.

Accidental Injuries did not differ materially from the results of previous years. There was a considerable excess of admissions in the Cavalry and Artillery, dependent on the nature of their duties, but in none of the arms was there any amount of mortality from them worthy of notice.

The following Table shows the admissions, deaths, and invaliding in each Corps serving in the United Kingdom during the whole year:—

United Kingdom.

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Total Deaths.	Discharged as Invalids.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Annual Ratio per 1,000. Invalided.	Stations. months.
1st Life Gds.	406	240	3	..	3	14	591·1	7·39	34·48	Windsor 3; London 9
2nd „	409	224	4	1	5	13	547·3	12·22	31·79	London 12
R. Horse Gds.	401	186	2	..	2	1	463·8	4·99	2·50	London 3; Windsor 9
Total Household Cavalry	1,216	650	9	1	10	28	534·5	8·22	23·03	
1st Dr. Gds.	530	461	3	2	5	15	869·8	9·43	28·30	Sheffield, &c. 2; Manchstr.&c. 8⅓; Cahir, &c. ⅔
3rd „	507	540	3	3	6	15	1065·1	11·83	29·59	Chichester 3; Colchester 9
4th „	523	407	2	4	6	14	778·2	11·47	26·77	Brighton & Shorncliffe 7⅔; Sheffield, &c. 3⅓; Manchstr.&c. 1
5th „	532	278	3	1	4	14	522·6	7·52	26·32	Aldershot 8; Leeds, &c. 4
6th „	534	439	2	..	2	14	822·1	3·75	26·22	Longford, &c. 6⅔; Curragh & Newbridge 5⅓
7th „	525	420	5	..	5	14	800·0	9·52	26·67	Colchester 3; Aldershot 9
1st Dragoons	533	408	3	2	5	16	765·5	9·38	30·02	Dublin 10; Cahir, &c. 1⅔; Ballnellig.&c. ⅓
2nd „	529	392	6	1	7	27	741·0	13·26	51·27	Cahir, &c. 10; Dublin 2
6th „	522	478	2	1	3	25	915·7	5·75	47·89	Manchester 3; On march ½; Aldershot 8½
8th Hussars	529	269	2	..	2	13	508·5	3·78	24·58	Edinburgh 6½; Dundalk 5½
9th Lancers	520	325	3	..	3	26	625·0	5·77	50·00	Curragh 8; Hounslow,&c. 4
10th Hussars	537	356	1	..	1	7	662·9	1·86	13·04	Aldershot 7⅔; Brighton & Shorncliffe 4⅓
12th Lancers	535	291	3	2	5	4	543·9	9·35	7·48	Dundalk, &c. 7; Curragh 3; Dublin 2
14th Hussars	535	457	2	..	2	13	854·2	3·74	24·30	Dublin 6⅔; Curragh 3; Longford 2⅓
17th Lancers	532	310	4	..	4	16	582·7	7·52	30·08	Hounslow,&c. 7; Edinburgh 5
Total Cavalry of Line	7,923	5,831	44	16	60	233	736·0	7·57	29·40	

United Kingdom.

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Total Deaths.	Discharged as Invalids.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Annual Ratio per 1,000. Invalided.	Stations.
Rl. Artillery:										
B Brigade R.H.A.	878	727	8	2	10	47	828·2	11·39	53·53	A Newbrdg. 8 months; Woolwch. 4 months. B Leeds 8 months; Aldershot 4 months. C Dublin 8 months; Woolwch. 4 months. D Woolwch. 8 months; Norwich 4 months. E Woolwch. 8 months; Dorchestr. 4 months.
C Brigade R.H.A.	890	633	5	..	5	30	711·2	5·61	33·71	A Dorchestr. 8 months; Aldershot 4 months. B Norwich 7½ months; Newbrdg. 4½ months. C Aldershot 8 months; Dublin 4 months. D Aldershot 8 months; Woolwch. 4 months. E Aldershot 8 months; Preston 3⅔ months; Manchstr. ⅔ months.
Riding Establishment	209	144	2	..	2	7	689·0	9·57	33·50	Woolwich 12 months.
4th Brigade.	367	385	5	..	5	33	1049·1	13·62	89·92	A Woolwich 3 months; On march ½ month; Fermoy 1½ months; Dallincollig 7½ months. B Woolwich 7⅔ months; On march ⅔ month; Curragh 1⅓ months; Dublin 2⅓ months.
7th „	839	615	4	1	5	37	736·6	5·96	44·10	Nos. 1, 2, & 3 Woolwh. / Shoebury ness 12 months. Nos. 4,5,6 Sheerns. / Woolwh. 12 months. Nos. 7 & 8 Dublin / Woolwh. / Sheerns. 12 months.
11th „	1,418	1,364	12	4	16	80	961·9	11·28	56·41	A .. Woolwich 12 months. B Aldershot 7⅔ months; Hilsea 4⅓ months. C Hilsea 5 months; Aldershot 7 months. D Aldershot 8 months; Woolwich 4 months. E&F Shorncliffe 12 months. G Woolwich 5 months; Aldershot 7 months. H .. Hilsea 12 months.
12th „	752	768	4	..	4	52	1021·3	5·32	67·58	Portsmouth / Channel Is. 12 months.

United Kingdom.

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Total Deaths.	Discharged as Invalids.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Annual Ratio per 1,000. Invalided.	Stations.
										months.
13th Brigade	797	464	2	1	3	19	582·2	3·76	23·84	Nos. 1 & 2 Plymth. 2 Nos. 3 & 4 Ireland 3⅝, Plymth. 8½ Nos. 5 & 8 Pmbke / Plymth 12 Nos. 6 & 7 Plymth. 3, Ireland 9
14th „	168	115	1	..	1	..	684·5	5·95	..	H Leith Fort, 12
17th „	849	525	12	1	13	18	618·4	15·31	21·02	Dover, except 2 batteries in Ireland from April 12
21st „	745	535	9	1	10	21	718·1	13·42	28·22	Gosport, with Detachment in Isle of Wight 12
Total Royal Artillery	7,912	6,275	64	10	74	344	793·1	9·35	43·47	
Military Train	665	331	8	..	8	19	497·7	12·08	28·64	Aldershot 12
	62	24	..	..	..	..	387·1	..	..	Chatham 12
	315	253	3	..	3	26	803·2	9·52	82·54	Dublin & Curragh 12
	59	53	..	..	..	4	898·3	..	67·97	Shorncliffe 12
	543	192	3	..	3	29	353·6	5·52	53·41	Woolwich 12
Total ..	1,644	853	14	..	14	78	518·9	8·52	47·43	
Gren. Gds., 1st Bn. ..	803	450	3	3	6	20	597·8	7·47	24·91	London 2 Dublin 4⅜ Curragh 3 Dublin 2⅓
2nd Bn. ..	806	552	7	..	7	19	684·9	8·68	23·57	London 6 Windsor 6
3rd Bn. ..	808	616	5	1	6	23	762·4	7·43	28·46	Dublin 2 London 6 Windsor 4
Coldm. Gds., 1st Bn. ..	804	622	3	2	5	23	773·6	6·22	28·61	London 11 Aldershot 1
2nd Bn. ..	803	470	4	1	5	24	560·4	6·23	29·90	Windsor 2 London 10
Scots F. Gds., 1st Bn. ..	810	458	5	3	8	38	565·4	9·88	23·47	London 11 Aldershot 1
2nd Bn. ..	808	439	6	2	8		543·3	9·90		London 12
Total Foot Guards	5,642	3,617	33	12	45	147	641·1	7·98	26·05	
2nd Foot, 2nd Bn.	632	535	4	2	6	10	846·5	9·49	15·82	Aldershot 8½ Portsmouth 3½
3rd Foot, 2nd Bn.	614	473	2	..	2	13	770·4	3·26	21·17	Bristol & Devonport 4½ Aldershot 7½

United Kingdom.

Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Total Deaths.	Discharged as Invalids.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Annual Ratio per 1,000. Invalided.	Stations.	months.
4th Foot, 1st Bn.	629	431	1	3	4	22	685·2	6·36	34·98	Dover	12
4th Foot, 2nd Bn.	618	455	2	1	3	15	721·2	4·85	24·27	Dublin	5
										Chester & Weedon	7
5th Foot, 2nd Bn.	623	401	3	..	3	11	643·7	4·82	17·66	Aldershot	8
										Glasgow & Ayr	4
6th Foot, 2nd Bn.	626	423	..	1	1	5	675·7	1·60	7·99	Aldershot	4⅓
										Newport & Brecon	7½
7th Foot, 2nd Bn.	629	586	3	3	6	20	903·0	9·53	31·80	Bury Liverpool Bradford	3⅓
										Aldershot	8⅔
8th Foot, 2nd Bn.	618	517	2	2	4	5	836·6	6·47	8·09	Aldershot	3⅓
										Bury & Ashton	8⅓
9th Foot, 2nd Bn.	603	465	6	..	6	25	771·2	9·95	41·46	Dublin	5
										Warley, &c.	7
12th Foot, 1st Bn.	614	402	2	1	3	18	654·7	4·89	29·32	Devonport	2⅔
										Aldershot	8⅓
										Carlisle, &c.	1
13th Foot, 2nd Bn.	609	483	2	..	2	20	793·1	3·28	32·84	Gosport	5
										Aldershot	7
15st Foot, 2nd Bn.	632	350	3	..	3	14	553·8	4·75	22·15	Cork	5
										Dublin	7
17th Foot, 1st Bn.	854	559	6	1	7	8	654·6	8·20	9·37	Newry	7½
										Dublin	4½
17th Foot, 2nd Bn.	614	676	3	1	4	14	1101·9	6·51	22·80	Mullingar, &c.	3⅓
										Channel Is.	8⅔
18th Foot, 1st Bn.	636	400	1	1	2	24	628·9	3·14	37·74	Curragh	9⅔
										Belfast & Newry	2⅓
20th Foot, 1st Bn.	614	315	5	..	5	9	513·0	8·14	14·66	Aldershot	4⅔
										Bristol, Plymth., & Exeter	6⅓
										Kilkenny Curragh	⅔
22nd Foot, 2nd Bn.	614	401	2	2	4	8	653·1	6·51	13·03	Newcastle, Sndrlnd., & Tynemouth	3⅓
										Sheffield	8⅓
23rd Foot, 2nd Bn.	634	463	5	..	5	13	730·3	7·89	20·51	Newport & Brecon	4⅓
										Aldershot	7½
25th Foot, 1st Bn.	621	384	6	..	6	21	618·4	9·66	33·82	Aldershot	9
										Portsmouth	3
27th Foot ..	630	615	12	..	12	31	976·2	19·05	49·21	Chatham	12
										Detach. at I. of Grain & Tilbury	3⅔
33rd „ ..	670	439	2	2	4	54	655·2	5·97	80·60	Portsmouth	12

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Regiments, &c.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Total Deaths.	Discharged as Invalids.	Annual Ratio per 1,000. Admitted.	Died.	Invalided.	Stations.
										months.
34th Foot ..	605	508	2	1	3	19	839·7	4·96	31·41	Aldershot 7⅓ Shorncliffe 4⅔ Detachts. at Isle of Grain, Upnor, and Tilbury.
35th „ ..	610	455	6	..	6	50	745·9	9·84	81·97	Portsmouth 4 Aldershot 7⅓ Bradford, Liverpool, Fleetwood ⅔
40th „ ..	627	466	6	..	6	7	743·1	9·59	11·16	Carlisle, &c. 11⅓ Mullingar, &c. ⅔
42nd „ ..	632	347	..	2	2	16	549·1	3·16	25·32	Edinburgh 10⅓ Aldershot 1⅔
43rd „ ..	613	488	1	5	6	20	796·1	9·79	32·63	Channel Isles 3⅔ Curragh 6⅓ Dublin 2⅓
44th „ ..	628	406	3	..	3	36	646·5	4·78	57·33	Kilkenny, &c. 7 Curragh 3 Enniskillen with Detach. 2
46th „ ..	625	572	2	1	3	26	915·2	4·80	41·60	Parkhurst & Winchester 4 Portsmouth 8
51st „ ..	626	303	..	8	8	7	484·0	12·78	11·18	Portland & Weymouth 12
54th „ ..	626	511	9	1	10	26	816·5	15·97	41·53	Belfast, &c. 9⅔ Mullingar, &c. 1⅓ Athlone, &c. 1
56th „ ..	657	412	7	2	9	13	627·1	13·70	19·79	Watrfrd., &c. 5 Dublin 7
57th „ ..	619	481	3	2	5	12	777·7	8·08	19·39	Aldershot 2⅓ Devonport 9⅔
63rd „ ..	649	411	3	4	7	19	633·3	10·79	29·28	Cork, &c. 1⅔ Fermoy, &c. 8 Kinsale, &c. 2⅓
65th „ ..	685	854	8	..	8	24	1252·5	11·74	35·20	Dublin 7⅔ Curragh 2 Fermoy, &c. 2⅓
66th „ ..	843	645	2	1	3	34	747·7	3·56	40·33	Dublin 1⅓ Curragh 10⅓
67th „ ..	620	713	6	..	6	37	1150·0	9·68	59·68	Portsmouth 7⅓ Aldershot 4⅓
68th „ ..	628	342	1	..	1	27	545·6	1·59	42·99	Manchester 8⅓ Cork, &c. 3⅔
70th „ ..	613	299	..	..	..	20	487·8	..	32·62	Kinsale, &c. 9⅔ Limerick 2⅓
72nd „ ..	696	228	4	3	7	14	327·6	10·06	20·12	Limerick, &c. 9⅔ Buttevant, &c. 2⅓
80th „ ..	624	315	4	1	5	16	504·8	8·01	25·64	Fleetwd., Leeds, & Liverpool 11⅓ Birr, &c. ⅔
81st „ ..	717	453	6	1	7	40	631·8	9·76	55·79	Buttevant, &c. 8 Templmr., &c. 4

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Regiments, Depôt Brigades, and Depôt Battalions.	Average Annual Strength.	Admitted into Hospital.	Died. In Hospital.	Died. Out of Hospital.	Total Deaths.	Discharged as Invalids.	Annual Ratio per 1,000. Admitted.	Died.	Invalided.	Stations.	months.
89th Foot ..	857	777	6	4	10	21	906·6	11·67	24·50	Athlone, &c.	10
										Fermoy	2
91st „ ..	657	498	3	..	3	11	758·0	4·57	16·74	Dover	12
94th „ ..	624	668	2	3	5	26	1070·5	8·01	41·67	Dover	4⅔
										Woolwich	7⅓
97th „	615	409	3	1	4	12	665·0	6·50	19·51	Aldershot	4⅔
										Dover	7⅓
98th „ ..	628	263	4	..	4	14	418·8	6·37	22·29	Aldershot	4
										Newcastle & Tynemouth	8
100th „ ..	643	419	2	1	3	19	651·6	4·67	29·55	Glasgow, Paisley, and Ayr	8⅓
										Manchester	3⅔
2nd Bn., Rifle Brig.	626	621	3	..	3	23	992·0	4·79	36·74	Devonport	5⅔
										Aldershot	6⅓
4th Bn., Rifle Brig.	614	455	3	..	3	15	741·0	4·89	24·43	Chester and Weedon	5
										Aldershot	7
Total Infantry Regiments	31,541	23,092	171	61	232	964	732·1	7·36	30·56		
Depôt, R.H.A.	445	618	1	..	1	20	1388·8	2·25	44·94	Maidstone	12
1st Div., Dep. Brig. R.A.	600	645	1	..	1	24	1075·0	1·67	40·00	Sheerness	3
										Woolwich	9
2nd „ „	1,353	1,203	10	3	13	38	445·6	9·61	28·09	Woolwich	12
Total ..	2,398	2,466	12	3	15	82	1028·4	6·26	34·19		
Cavalry Depôt	1,090	1,057	13	..	13	34	992·3	11·95	31·19	Canterbury	12
1st Dep. Bn.	898	904	6	..	6	90	1006·6	6·68	100·23	Chatham	12
2nd „ ..	1,056	958	13	4	17	43	907·2	16·10	40·72	Chatham	12
3rd „ ..	875	657	11	3	14	39	750·9	16·00	44·57	Pembroke Dock	12
4th „ ..	766	828	3	1	4	36	1081·0	5·22	47·00	Colchester	12
5th „ ..	699	772	14	..	14	24	1104·5	19·98	34·34	Parkhurst	12
6th „ ..	1,028	828	8	1	9	50	805·5	8·76	48·64	Shorncliffe	12
7th „ ..	852	744	13	2	15	28	873·2	17·61	32·86	Winchester	12
8th „ ..	542	518	..	3	3	16	955·7	5·54	29·52	Colchester	12
9th „ ..	1,064	872	11	3	14	67	819·6	13·16	62·97	Preston	12
10th „ ..	973	987	8	..	8	55	1014·4	8·22	56·53	Shorncliffe	12
11th „ ..	843	610	11	4	15	19	723·6	17·79	22·54	Aberdeen	12
Total Depôt Bns.	10,686	9,735	111	21	132	501	911·0	12·35	46·88		

In the Household Cavalry the 1st Life Guards had the highest proportion of admissions into hospital and of discharges by invaliding, and the 2nd Life Guards of deaths. The excess of admissions was chiefly in diarrhœa and dyspepsia, abscesses, and contusions. The ratio of admissions, deaths, and invaliding was lowest in the Royal Horse Guards.

In the Cavalry of the Line the admissions were highest in the 3rd Dragoon Guards at Chichester and Colchester, principally from ulcers and boils, itch,

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gonorrhœa, slight wounds and ophthalmia, and were lowest in the 8th Hussars at Edinburgh and Dundalk. The deaths were highest in the 2nd Dragoons at Cahir and Dublin, the excess being chiefly in diseases of the circulatory system, and lowest in the 10th Hussars at Aldershot, Brighton, and Shorncliffe. The discharges by invaliding were highest in the 2nd Dragoons, and lowest in the 12th Lancers at Dundalk.

In the Artillery the highest ratio of admissions and invaliding was in the 4th Brigade, and of deaths in the 17th, while the lowest ratio of admissions and deaths was in the 13th Brigade, and of invaliding, with the exception of the single battery 14th Brigade, in the 17th Brigade.

In the Foot Guards the ratio of admissions was highest in the 1st Battalion Coldstream Guards stationed in London for 11 months and Aldershot for 1 month, chiefly from venereal diseases, and lowest in the 2nd Battalion Scots Fusilier Guards in London. The Scots Fusilier Guards had the highest ratio of deaths, and the Coldstream Guards the lowest, but the proportion discharged by invaliding was highest from the latter, and lowest from the former.

The 65th Regiment at Dublin, the Curragh, and Fermoy, had the highest proportion of admissions in the Infantry, the excess being chiefly in syphilis and gonorrhœa, and the 72nd at Limerick and Buttevant had the lowest; the 27th the highest ratio of deaths, and the 70th the lowest; the 35th the highest proportion discharged by invaliding, and the 2nd Battalion 6th Regiment the lowest.

Re-Vaccination.—The returns furnished monthly from all the corps serving in the United Kingdom, and of which a summary will be found in Abstract No. 2 in the Appendix, show the results of vaccination in 180 soldiers, and 11,011 recruits to have been as follows:—

	Total number Vaccinated.	Results.	Ratio per 1,000. In those who bore marks of previous Small-Pox.	In those who bore good marks of previous Vaccination.	In those who bore doubtful marks of previous Vaccination.	In those who bore no marks of previous Vaccination or Small-pox.	Total.
Soldiers, not Recruits	480	A perfect Vaccine Pustule	210·5	221·6	428·6	428·6	247·9
		A modified ditto	552·6	482·9	214·3	542·9	477·1
		A failure	236·9	295·5	357·1	28·5	275·0
		Total	1000·0	1000·0	1000·0	1000·0	1000·0
Recruits ..	11,011	A perfect Vaccine Pustule	269·5	279·2	353·5	583·3	292·2
		A modified ditto	305·1	376·3	469·8	226·9	368·6
		A failure	425·4	344·5	176·7	189·8	339·2
		Total	1000·0	1000·0	1000·0	1000·0	1000·0

Compared with the results for 1868, this Table shows a large increase in the proportion of modified pustules among the soldiers, and a decrease in both perfect pustules and failures. Among the recruits the proportion of perfect vaccine pustules has been exactly the same in both years, while there has been an increase in the modified pustules and a decrease of failures.

The state of vaccination among the recruits found fit for service at the Head-Quarters of the Recruiting Districts is shown in the following Table:—

Recruiting Districts.	Marks of Small-Pox.	Marks of Vaccination.	No satisfactory Marks.	Proportion in every 1,000. Marks of Small-Pox.	Marks of Vaccination.	No satisfactory Marks.
London	152	3,860	117	36·8	934·9	28·3
Liverpool	52	767	82	57·7	851·3	91·0
Bristol	63	442	23	119·3	837·1	43·6
York	29	329	16	77·5	879·7	42·8
Glasgow	36	338	62	82·6	775·2	142·2
Belfast	30	431	83	55·1	792·3	152·6
Dublin	25	462	8	50·5	933·3	16·2
Total England ..	296	5,398	238	49·9	910·0	40·1
Total Scotland ..	36	338	62	82·6	775·2	142·2
Total Ireland ..	55	893	91	52·9	859·3	87·6
Total ..	387	6,629	391	52·2	895·0	52·8

Compared with the preceding year there has been a decrease in the proportion having marks of small-pox in England and Scotland, but an increase in Ireland. In England the proportion bearing marks of vaccination has increased, but in Scotland and Ireland decreased; while of those with no satisfactory marks the proportion has more than doubled in Scotland, and has increased to a slight extent in both England and Ireland. Scotland has in this year furnished much the highest proportion of unprotected men.

SANITARY REPORT.

Camp of Aldershot.

Inspector-General Lawson reports:—

There is no prominent sanitary defect at this station. The latrines in the North Camp are fitted with tanks only, and are occasionally offensive during warm weather when not closely attended to, but no marked injury has as yet been traced to them. It would be well, however, if some other system could be substituted.

Ventilating shafts and the Anglo-American Grates have been introduced into a portion of the West Infantry Block. The shafts have been made straight, so that they can be easily examined, and unnecessary impediments to the passage of air removed. The cubic space in barracks and hospitals and means of ventilation otherwise are unchanged. The means for cooking are ample, and the rations have been of good quality and unchanged in quantity.

A lavatory for night ablution was erected in the East Infantry Block. The men could not be induced to make very free use of it, and an examination of the returns for the corps in this barrack, as well as of others in the vicinity and elsewhere, some of which had a system of ablution in use (regimentally), showed that in those in which these facilities were afforded after return to barracks, the men not only did not present greater immunity from venereal affections than those in which such measures were not adopted, but, on the contrary, in some instances they had actually more disease than others in which no such precautions were enforced. Ablution after exposure to contagion is, no doubt, beneficial, but to be really effective it should be had recourse to immediately; the experience here shows that when delayed until return to barracks, it may not prevent frequent attacks of disease, but that there may even be other influences at work in connection with particular corps which more than counterbalance any advantage arising from it.

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Camp of Colchester.

Deputy Inspector-General Gibb reports :—

The Surgeon of the 3rd Dragoon Guards remarks in his Report that the barracks and other appliances for the soldier in *health*, are good, and leave nothing to be desired, but the hospital accommodation is bad. In the hospital huts it is difficult to regulate the warmth, as they are hot in summer and cold in winter.

With regard to the ration, I consider that the recruit requires some addition to his meals.

An excellent arrangement has been made in the 3rd Dragoon Guards for giving to each man a cup of coffee during winter, before going to morning stables, which is defrayed from the profits of the canteen. The Surgeon reports favourably of it in a sanitary point of view.

The Medical Officer in charge of the 4th Depôt Battalion in camp states "that the health of the corps has been on the whole good, and that the situa-"tion of the camp, though exposed, is healthy"; "that a few cases of typhus "and enteric fevers occurred, the cause of which was obscure, although pro-"bably due in the first instance to personal intercourse with dwellers in a "low-lying part of the town, in which enteric fever has been endemic during "the year." Also, "that in severe weather the supply of coal to the troops "is insufficient, and that the system of warming the huts by stoves is unde-"sirable, as tending to induce excessive dryness of the atmosphere, and "extremes of heat and cold."

The Surgeon of the 8th Depôt Battalion appears to be satisfied with the sanitary arrangements of the camp, and reports, "that his battalion has been "very healthy this year." He thinks that the allowance of coal for the hospital hut in winter is generally insufficient, but no representations were made, as extra fuel is always procurable on requisition. When a fire has to be kept up at night, extra fuel is granted.

The alterations and sanitary improvements effected at this station during the year were few. No buildings were erected.

In the camp the latrine and urinal of the Main Guard were re-constructed and flushed with water.

The canteen was purchased by the Government and improved: it is carried on upon the regimental system by the two Depôt Battalions.

The east end of the Cavalry Barracks was fenced in with iron railings.

The hospital kitchen was enlarged by the removal of a partition, and a new range (Deane's) placed in it, which is a marked improvement, as well as a more economical arrangement.

The hospital huts were re-painted.

The chief improvements proposed in the Estimates for 1870-1, are the following :—

1. A new provost prison, the present one being most defective in space, and in proper ventilation of the dormitories.
2. Improving the water supply in camp.
3. Raising the partitions in married quarters in camp, which is desirable.
4. Planting trees in the Abbey field, an extensive space between camp and barracks, which is bare and exposed: trees planted along its borders would be a great improvement for obvious reasons.

The following are improvements I would suggest for this station :—

1. The latrines to be converted into the "dry earth system."
2. A detached hut with two compartments in the hospital enclosure, for isolation and treatment of infectious diseases among women and children.
3. Porches in the exposed ends of the hospital huts.

There is an excellent gymnasium at this station. The soldiers' gardens are highly appreciated, and successfully cultivated.

The employment of soldiers in trades was established during the latter part of this year, and sufficient time has not elapsed to report on its success, but much benefit will result from variety of occupation when the system is fully matured.

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The station maintains its character for salubrity. The mortality in hospital was 8,—4 from pulmonary disease—a large reduction compared to last year.

During the year a very marked improvement has taken place in the prevalence of venereal disease among the troops, for which this station had become rather notorious. In 1868 it amounted to 40·56 per cent. of all the admissions. In 1869 it is reduced 24·26 per cent. of all admissions. The admissions for syphilis are reduced one-half compared to last year.

Night ablution rooms exist in camp and barracks, but the Surgeons report that they are not much resorted to. The striking reduction in the amount of venereal may be principally ascribed to the fact that Colchester is under the operation of the Contagious Diseases Act, and that a Lock hospital was opened in January.

Norwich, Harwich, and Landguard Fort are the other military stations in this district. There is nothing urgently required at the first-named station. At Harwich the latrines are to be renewed, being very defective. Landguard Fort being very old, and badly constructed, is scarcely fit for occupation by troops.

Shorncliffe Camp.

Deputy Inspector-General Guy reports—

The small amount of sickness and mortality during the year may be regarded as evidence of the healthiness of the camp. Its salubrity is still further confirmed by the absence of disease usually associated either with overcrowding, (typhus fever) or air or water defilement from fœcal contamination (enteric fever).

Eleven deaths out of the 21 have been from that scourge of all armies, pulmonary consumption. In majority of instances hereditary predisposition appears to have existed.

The number of cases of intemperance admitted into hospital has not been large, due it may be considered to two causes, viz., more regular and temperate habits, but mainly to the absence of adulteration in the liquors sold at the canteen.

The Contagious Diseases Act appears to exert a beneficial influence, not merely in lessening the number of admissions for veneral affections, but also in mitigating their severity. It is to be hoped that the means for personal ablution will further check the occurrence of syphilitic disease, though from conversations with Medical Officers, I am led to believe that the men do not avail themselves of the means specially placed at their disposal.

I am able, from personal knowledge, to confirm the opinions expressed by the Medical Officers as to the adequacy of the culinary and ablution arrangements, and as to the absence of nuisances from ill-regulated latrines, ash pits, or manure heaps. Except that of the surface (which is being improved), the drainage of the camp generally is satisfactory.

The water supply is admitted by all to be pure and plentiful, and the rations generally are reported as good.

It cannot be denied that in their present condition the huts are very draughty and leaky, and with the wind in certain quarters, rain beats freely into the room. The free, perhaps too free, perflation of air, can to a certain extent be rectified by the issue of additional blankets and extra fuel. These avail but little against the rain. That a porch erected at the entrance of the huts would add most materially to the comfort and health of the men, will not, I imagine, be denied. It is possibly owing to very free passage of air through the huts, that the dampness of the floors has not acted more prejudicially on the health of the men.

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Chatham District.

Deputy Inspector-General O'Flaherty writes:—

The Medical Officers in charge of corps and stations in this district have not reported any special causes as having injuriously affected the health of the troops.

The defects I have observed, and for which remedies are required, are:—

1st. Additional married quarters to the Royal Engineer barracks, and until such are provided, a better latrine accommodation to the old cottages in which married families of the Royal Engineers now reside.

2nd. The hut barracks at Brompton:—if these are to be permanently occupied as married quarters, require to be altered into four separate rooms, with fireplaces, as has been done at almost all other stations where huts for married people are occupied by them.

3rd. At Maidstone new married quarters are urgently required. The houses in the town at present occupied by married families, and temporarily hired for the purpose, are unsuited for the number in them. They are also small and inconvenient, badly cleaned, and have miserable latrine accommodation. I would suggest, until the usual married barracks are erected, that better houses be hired. From enquiries, I believe very good accommodation may be hired at this station, and in the vicinity of the present quarters.

There are three excellent laundries in possession of the troops in Chatham and Brompton Barracks, but like most other laundries that I have inspected, they are not utilised to the extent or in the manner that they might be, and I would respectfully beg to suggest the remedy previously detailed by me in my Sanitary Report from the Dublin District, and published in the Army Medical Statistical and Sanitary Report for 1863, page 288.

Deputy Inspector-General O'Flaherty suggests, as a subject well worthy of consideration, whether the heads and hocks of beasts, if contracted for with the other parts, might not be provided at almost present cost, and issued in proper proportions with the present ration, so that a daily bowl of soup might be given to each man without reference to the meal being a roast or boiled one. If this suggestion were adopted, the soldier, writes Mr. O'Flaherty, will have his ¾ pound of meat supplemented by an increased daily *bulk* of food, a great essential when a larger solid meat base than ¾ of a pound, including bone, is not attainable.

There appears to be a very general opinion that the amount of the soldier's ration might be increased with advantage, and it is in the albuminous elements that this increase is required. It is believed, however, that the authorities, before increasing the soldier's daily pay, fully enquired into this subject, and came to the conclusion that, as neither the appetite for, nor the consumption of meat was the same in all soldiers, the preferable course would be to increase the daily pay to an extent that would be equivalent to the cost of the issue of an extra quarter of a pound of meat, which has accordingly been done. The soldier can, therefore, if he desires, supplement the Government ration by private purchases.

The improvements carried out in this district during the year have been in Chatham Barracks, where the men's rooms, front and rear, have been thrown into each other by the removal of the partition walls,—a very great improvement, and very generally appreciated by the occupants, giving more light and floor space, and although it has reduced the temperature by two degrees, this was only ascertained by the thermometer.

The Contagious Diseases Act is in operation in this district, at Chatham Maidstone, and Sheerness; during 1869 a civil surgeon had charge, and persons subject to this law were treated in the hospital of St. Bartholomew in Chatham, the excess that could not be accommodated in that institution being treated in hospital in London. A Government hospital has been since completed and occupied, and a military Medical Officer appointed to carry out the Act in the above-named places in this district; he is aided by detachments of police at each station.

In each of the barracks there are conveniences for special nightly ablution; but I have reason to believe they are not much resorted to by the men.

Woolwich.

Deputy Inspector-General Inglis, C.B., makes the following observations:—

The general health of these troops has been on the whole satisfactory, and the absence of any outbreak of disease in an epidemic form leaves but few data at disposal on which to ground a sanitary report. It may be noticed that by the removal of the Division Royal Marines from Woolwich a considerable amount of barrack accommodation, including all that fine mass of building known as the Marine Barracks and hospital, has been placed at the disposal of the military authorities, so that unless it is intended abnormally to augment the garrison hereafter, no apprehension of overcrowding need be entertained.

At my various sanitary inspections I found no excessive occupation to exist in the barrack-rooms, though there is room for considerable amelioration in this respect, as regards the allotment of space to families in huts and the various ranges of quarters assigned for their use in the neighbourhood. On the 94th Regiment taking over the Marine Barracks, exception was taken, on sanitary grounds, to some very badly lighted and low-roofed rooms on the basement of that portion of the building formerly used for hospital purposes. The result of a recommendation made on the subject was the removal of the men, though the rooms in question continue to be occupied by a limited number of married men and their families. Regarding certain sanitary defects connected with the basement story of the Military Train Barracks' (old hospital, Royal Artillery), and the objection urged by the Medical Officer in charge to the occupation of this portion of the building on account of its low level and proximity to the former system of sewerage of the building, it will be seen, by reference to the list of sanitary services performed by the Royal Engineer Department subjoined, that the defects have been to a great extent remedied, though I am still of opinion that rooms so close to, and under the level of the soil are unfit for habitation. The reports of the several Medical Officers indicate no serious sanitary deficiencies, and I would here mention that, as a rule, the officers in question have in their monthly sanitary recommendations evinced much discretion, bringing nothing to notice in a spirit at variance with fair and legitimate representation, and with results highly satisfactory and conducive to the good of the service and welfare of the soldier. The general occupation of the rooms I found often to be under, and never exceeding, the allotment painted over the entrances, and the lighting, warming and ventilation as good as the general construction of barracks will admit of.

I did not discover any marked difference in the health of the troops quartered over stables and those otherwise disposed of. In regard to conservancy of barracks and their precincts, it would appear that the arrangements in connection with the latrines and urinaries are not sufficient to control the evolution of effluvia in their immediate vicinity, notwithstanding the efforts of regimental authorities to keep the receptacles well flushed and cleared. It is difficult to suggest a remedy. The dry earth system of conservancy has been suggested for reasons of an economic as well as a sanitary nature, but it is doubtful whether, putting aside the large amount of space required for storage, the earth can be maintained in a sufficiently dry state in our moist climate for the purpose of deodorization. No change appears to have taken place in regard to the dietary of the troops during the period, either in respect to quantity or average quality. It has been often urged that a pound of meat with bone would not be too much in this climate, and certainly considering the heavy duties gunners and all other men of the mounted branches especially perform, I do not consider the appeal for a moderate increase unreasonable. The means of avoiding monotony in food seem tolerably satisfactory. The several cooking ranges are generally ample, and so provided as to admit of considerable variety in the preparation of food. The ablution rooms throughout appear to be sufficiently well supplied with water, the basins and utensils being variously made of porcelain and corrugated iron, fitted with past. There are numerous baths well supplied with cold water; but to induce men to make more frequent use of them, in winter especially, the means for

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supplying warm water will require to be added. The floors of the ablution rooms are generally paved with asphalte, and well provided with wood gratings to protect the feet; the utensils are arranged on stands at a convenient height for use, but the addition of a few chairs and forms to enable the men to dress comfortably after their ablutions is desirable.

The following is the list of sanitary services executed by the Royal Engineer Department during the year 1869:—

Military Train Barracks.—Open sunk ash-pits removed in yards of officers' quarters, and cast-iron bins and landings substituted.

Bell traps of sinks renewed about barrack yards generally.

Open cess-pool in servant's privy of Commanding Officer's quarters removed, and water-closet apparatus, laying on water, &c, substituted.

Old latrine and coal-yard removed, and Macfarlane's latrine and urinal for men and women erected.

Nos. 4 to 18 soldier's rooms converted into Staff Serjeants' quarters, and provided with a married soldier's stove in each day room.

Royal Horse Infirmary. Urinals improved.

Remount.—Latrine and urinal constructed.

In reference to the prevalence of venereal disease, it would appear the Contagious Diseases Act came into operation at Woolwich on the 1st October, 1866, since which there has been a sensible, though not a very rapid, diminution of enthetic diseases among the troops. As the power of the Act is now somewhat extended, reaching Greenwich and other communities in this vicinity, it is to be hoped that a corresponding prospective immunity will result. I anticipate, however, no very decided effect, with London so near and accessible to soldiers on pass. Indeed, till legislation extends its area of surveillance to all classes of the population, the arrest of the flow of contagion will at best only be palliative. I am glad, at all events, to be able to state from the reports of the Medical Officers under my superintendence, that there is not only a decrease in admission from venereal disease, but that the ravages and complications of syphilis are becoming less apparent, while the disease in its various forms is more under remedial agency than in former times. As it is by many (with some in dissent) contended that a syphilitic taint operates to a prolific degree in the production of constitutional deterioration, developing results that must seriously influence the efficiency of the Army, it may not be inappropriate here to assume that much of the mortality and invaliding during the year, particularly by phthisis and heart disease, have thus originated; and if the hypothesis be correct, the necessity for extending repressive measures for arresting the spread of social contamination appears great. By reference to the deaths in hospital at Woolwich it will be seen that fully half have resulted from pulmonary phthisis, and that 37 also of the large list of invalids exhibited evidences of the existence of this degeneration; it may, therefore, be easily credited how widely diffused are the germs of this disease among the population, and how deep a hold it has on the class from whence recruits for the Army, as a rule, are supplied. In regard to the comparative statistics of phthisis for the last two years, I find considerable uniformity to exist, the death rate from this cause for each year being a little over 4 per 1,000 of strength.

As to any special arrangement or facilities exist for nightly private ablutions by the men, I would observe that a private night urinal and lavatory has been constructed in barracks for the purpose, but I am unable to state to what extent it has been made use of.

In regard to invaliding during the period, I would observe that the reduction of the Army directed by Government will in some measure account for the extraordinary number returned; no doubt many of the men selected might have got through more or less perfunctory service in garrison, but who, furnishing no evidence of prolonged efficiency, or the prospect of responding to a call for emergent service, it was, under the circumstances, deemed advisable to bring them forward for discharge.

South-Western District.

Deputy Inspector-General C. A. Gordon, C.B., reports—

During the past year such improvements as were practicable were carried out in the barracks and hospitals in the District by the Local Authorities, and steps were taken to obtain sanction for such as required higher reference.

The following are some of the measures effected and contemplated:—

Portsmouth.—The ramparts round Portsea are being thrown down, and the moats, which have been a source of injury to health, are being properly filled in.

In Cambridge Barracks the private ablution rooms erected during the previous year have been taken into use.

Garrison Hospital.—The latrines have been improved in various respects: a building is in course of erection for the purposes of a women's hospital.

Southsea Castle.—The water tank has been thoroughly cleaned out.

Extra fuel was obtained for the rooms during winter, they being in many places leaky, apparently from age of the fortress.

Gosport Barracks.—Means of ablution and baths for the men are being extended, and a gymnasium has been erected.

Fort Monckton.—The state of the latrines has been considerably improved in the course of the year, yet some of them remain in a very objectionable state, a total re-construction being necessary.

Yaverland Fort.—A new water filter has been erected.

Gosport Garrison Hospital.—The baths have been improved, and sundry alterations made in the water closet.

Dorchester.—A cesspool in the near vicinity of a well has been deodorized, and the well itself ceased to be used for the time being.

Golden Hill Fort, Isle of Wight.—This fort has, for the first time, been occupied during the present year.

Portland.—A new building has been taken over as a military prison. A defect in the supply of water for hospital has been discovered and remedied.

Parkhurst.—A latrine on the old plan has been abandoned, and a proper system of water sewage introduced instead.

Clothing, &c.—Some of the Regimental Surgeons have recorded their opinion that the Norfolk tunic in its present shape is insufficient for winter wear. They would suggest that a waistcoat be worn in winter. The clothing of the Artillery is stated as being "the same the coldest day in winter and "the hottest day in summer,"—a cloak excepted.

Baths.—Some of the Medical Officers have represented the necessity of a supply of warm water being at all times available during the winter season.

Epidemics.—No disease has actually occurred in epidemic form. Scarlatina and measles, from time to time, appeared among the troops and their families, but active sanitary measures having been adopted, neither has spread to any considerable extent.

The operation of the Contagious Diseases Act has on the whole been decidedly successful.

Netley.

Inspector-General Beatson, C.B., reports:—

The admissions into the Royal Victoria Hospital during the year 1869 ave amounted to 3,651, of whom 3,425 were invalids from foreign stations.

Invalids.—Of the invalids, 1,542 arrived from India by the overland route, and 1,086 by the route *vid* the Cape of Good Hope, making in all from India 2,628.

The highest number of men in the Royal Victoria Hospital during the year 1869 was 625 on the 26th June, and for 63 days the numbers in hospital were over 500. The daily average on the whole year was 334·77.

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In my Sanitary Report for Netley for 1868 I alluded to the subject of invalids from India, and to the dates at which, in my opinion, the men should be invalided, and despatched from India. The experience of another year has further convinced me that if the Invaliding Boards were assembled in January instead of October, many men now invalided would be retained in India, and would prove perfectly efficient soldiers. During the present season of 1869–70 many men have come before me who have arrived at Netley, even by the short overland route, and almost at the beginning of winter, not only free from disease, but in robust health, proving that there was no organic disease, and probably but little tendency thereto; and consequently, that a sojourn in the hills of India, especially during the cold weather, would have quite restored these men to health and efficiency.

In my last year's Report I showed why in former days it was necessary to have the Invalid Boards in October, but that, under the altered circumstances of India, that necessity no longer exists.

Transport of Invalids from Portsmouth to Netley.—This is now entirely effected by rail, and may be pronounced as quite satisfactory. The South-Western Railway have placed certain carriages on the Netley line to be available for fitting up, by the use of the ordinary ambulance stretchers, for the more weakly and sickly men, so that such men are brought safely and comfortably to the Netley station. I need not say how great would be the improvement and the advantage, and how much labour and horse carriage would be saved if the railway were extended down to the hospital, even if the carriages were brought down on the rails by horse draught.

Water Supply.—There has been no difficulty in this respect, nor any scarcity of water during the year. The chief improvement has been the laying down of a greatly enlarged main pipe from the reservoir to the hospital.

Swimming Bath.—This is likely to be much more satisfactory than hitherto, as the windmill has been removed, and a steam engine substituted.

Officers' Quarters.—Since my last Report the Officers' quarters have been coated with Portland cement, which it is hoped will effectually protect them from damp. Prior to the application of the cement the rooms were in a most damp and unwholesome condition; but if it be found that they are now weather-proof, they will be comfortable enough as bachelors' quarters.

One great deficiency, however, at Netley, is the absence of any suitable quarters for married Medical Officers, the result being that almost every Medical Officer so circumstanced is a *non*-resident. This would be an evil, even if residences could be procured comparatively near the hospital; but, as it is the fact that married Officers doing duty at Netley reside, as a rule, several miles off, the evil is one, in my opinion, of serious magnitude, and therefore the necessity for having a moderate number of quarters suitable for married Officers of the rank of Surgeon-Major and Surgeon should, I humbly conceive, be recognised. It cannot be supposed that married Officers with families can be properly accommodated in the same number of rooms as are suitable for an unmarried Officer of the same rank; in fact, this is not supposed, at least I presume it is not expected, inasmuch as a suitable quarter has been, very properly, provided for the Chaplain, whose duties render it so desirable that he should reside at the hospital, so that his services may at all times be readily available. The necessity for a certain proportion of the Senior Medical Officers—Surgeons and Surgeons-Major—residing on the spot, is equally imperative, and should, in my opinion, be at once recognised, so that a fair proportion of the Senior Officers could be provided with suitable quarters, and have no longer any excuse for living at such inconvenient distances from their duties, as, under present circumstances, is simply unavoidable.

Married Soldiers' Huts and Orderlies' Barracks.—All in good and satisfactory condition, as are all the other hospital buildings.

Lunatic Hospital.—I was hopeful that ere this the new Lunatic Hospital would have been ready for occupation, but circumstances over which the Royal Engineer Department have been unable to exercise perfect control, have more or less delayed the full completion of the building; the time, however, cannot be far off now when it will be ready for occupation. Two of the Commissioners in Lunacy have lately inspected the building, with Surgeon-Major Blatherwick and myself. On the whole, I believe they were satisfied with the plan, but

certain defects were noted by them for representation to the proper authorities. One requirement which I believe they consider essential, but for which no provision had been made, is a residence close by for the Medical Officer in charge.

There is nothing further requiring remark, as the drainage and general sanitary condition of the hospital are quite satisfactory, and the water supply as good as the locality will admit of. As regards the hospital grounds, I confess I would like to see something more done in the way of planting clumps of trees, as each succeeding summer shows me how deficient the grounds are of necessary shade under which convalescent patients could breathe with comfort the fresh sea breezes.

If planted in clumps, and afterwards thinned, trees will thrive perfectly well at Netley; if put down in single rows, their ever attaining strength or maturity seems to me to be most problematical, as the fierce winds which blow occasionally with such force must more or less damage isolated trees.

Devonport and Plymouth.

Surgeon-Major Bone, in his Report for the garrisons of Plymouth and Devonport for the year 1869, makes the following remarks:—

In their Sanitary Reports the Medical Officers do not ascribe the attacks of sickness from which the men suffered to occasional or temporary causes of disease connected with the buildings occupied by them. The constant or permanent causes of disease which send men into hospital are the following, viz., changes of temperature, rain, dampness, night duties, and probably also crowding in barracks, and in guard and lock-up rooms—or inconveniences consequent on the occupation by many men of the same barrack, or guard, or lock-up room—drunkenness, filth, and accidents on and off duty, and sexual disorders also caused admissions into hospital.

In general, the married soldiers furnish fewer admissions into hospital in proportion to strength than the unmarried soldiers. In the 13th Brigade Royal Artillery at Plymouth, there are at present 56 married soldiers, and 397 unmarried. Among the married soldiers there were 15 admissions, and among the unmarried there were 355 admissions into hospital during the year 1869. The small number of admissions among the married soldiers, as compared with the large number among the single soldiers, has given rise to the notion that married soldiers are more valuable, that is, that the public gets more work out of them than it does out of the unmarried soldiers. But if inquiry be made, I think it will be found that the work of a regiment is done, not by the old and married soldiers, but by the single, and especially by the young soldiers. The old and married soldiers are generally employed as officers' servants, grooms, mess servants, store men, clerks, orderlies, lamplighters, &c., and these men, though counted among the duty men, hardly ever go on guard, or are warned for fatigue duty (*e.g.*, coal carrying on wet or snowy mornings). These old and married soldiers are, therefore, less exposed to some of the permanent causes of disease than the young and unmarried soldiers, and therefore furnish fewer admissions into hospital in proportion to strength.

Also, married soldiers, when obliged to report themselves sick, often beg the Medical Officer to allow them to "attend," and not to "admit" them into hospital; and the Medical Officer often does this, and therefore statistics which show that married soldiers are more valuable to the State than single soldiers are not, in my opinion, to be depended on unless it be shown that the old and married soldiers did their fair share of work, and were not exceptionally treated with respect to admission into hospital.

The alterations and improvements in the barracks at Devonport and Plymouth that were effected during the year were the following:—

In Raglan Barracks, Devonport, the bell court has been repaired, and a new door has been put up.

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In each wing of the barracks private ablution rooms have been made with the view of enabling the men to try to counteract the effects of impure sexual intercourse. The parade ground has been repaired, and a new water-closet, on McFarlane's pattern, has been put up for the use of the Provost-Serjeant of the garrison cells. In the garrison cells the ventilation has been improved, and more light has been admitted. In the general ablution rooms stop-cocks have been put in. The drainage of the canteen yard has been improved, and a new skittle-alley has been erected in the north wing. The want of sufficient light in the lock-up room attached to the guard-room in Raglan Barracks, north wing, is noticed by the Medical Officer in charge of the 57th Regiment.

In the Citadel of Plymouth the following have been the improvements and alterations during the year:—Air shafts have been introduced into a number of the married quarters. An underground drain has been made, leading from the pump, F house, to the main drain. Funnels have been placed over the gaslights, with pipes to conduct the foul air outside the barrack rooms and married quarters. On the recommendation of the Medical Officer, Royal Artillery, gas has been introduced into the underground ablution room in H house. In the range of married quarters, certain rooms which are below the level of the soil, and which had been occupied were vacated, and the married people were placed in rooms above the level of the soil, which had been previously used as stores for barrack furniture. The monstrous arrangement by which women and children were placed in rooms below the level of the soil, whilst barrack stores were placed in dry rooms above, was brought to notice by the Medical Officer, Royal Artillery, in Sanitary Report for the month of June 1868.

The alterations and improvements which have been effected at the hospital at Stoke, Devonport, during the year have been the following, viz:—In A pavilion a door has been made through the west wall, to form a private entrance for the resident Medical Officer. The 1½-inch hot-water pipes from the ground floor, B pavilion, have been removed, and 3-inch pipes have been substituted, and all the hot-water pipes have been covered with felt, and a water gauge, and taps, &c., have been put into the hot-water boiler. These alterations have been attended with success, and now hot water for the service of the hospital can be constantly obtained. Formerly the supply was often interrupted, and for long periods.

On the establishment of the Control System at the station, the Purveyor, or Steward, was withdrawn from his office at the hospital. He became a subaltern officer in the Control Department. He appears, however, to be still charged with the supervision of the diets, clothing, &c., of the patients.

A proposition to wash dirty barrack bedding in the hospital laundry, and to dry wet barrack bedding on the hospital grounds, was, in December 1869, referred to me for report. I stated that the plan appeared to be objectionable, because it would be productive of noise, disorder, dirt, and stench, and would interfere with hospital economy, which has for its ultimate object, not the establishment of a trade or business, but the welfare of the sick.

The Principal Medical Officer, in the Sanitary Report for last year, in noticing the mode by which the sick were conveyed from the distant barracks of Plymouth and Devonport to the hospital at Stoke, alluded to a recommendation (having economy and efficiency for its object) that had been made by the Medical Officer, Royal Artillery, viz., that a horse for the ambulance cart should be supplied either by the Field Battery, Royal Artillery, or by the Military Train. The correspondence that ensued did not come under the observation of the Medical Officer who brought the matter to notice, but eventually the Officer of the Military Train received orders to provide a horse for the ambulance cart, and by this arrangement the sum of 7*s.* 2*d.* a day has been saved to the public, viz., 5*s.* for the hire of a horse, 1*s.* a day wages, and 1*s.* 2*d.* a day the value of a ration to the driver.

At this station the Contagious Diseases Act has been in force since October 1866 I believe, and although the figures show that there has been a diminution in the number of admissions for venereal diseases during the last two or three years; yet, owing to the difficulties there are in the way of arriving at conclusions with respect to the working of the Act, it is not impossible

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that the slight reduction which has taken place in the number of admissions might be found (on inquiry) to depend on causes which are not connected with the operation of the Act. The provision by which poor diseased women are received into Lock hospitals and carefully treated is humane, and therefore good. In a former part of this Report it is stated, that in the barracks at Devonport two ablution rooms have been erected. In these places facilities exist for nightly private ablution by the men.

Northern District.

Deputy Inspector-General Bent reports :—

I have not been able to detect a connection between the ratios of disease and mortality and local insanitary conditions of either barrack or hospital, though occasional reports have been made by Medical Officers of the risk to health from temporary and other defects in drainage and construction.

There is, however, considerable difference in the healthiness of particular garrison towns, as shown by the Death and Invalid Returns—Manchester, Salford, Sheffield, and York contributing more largely to them than Birmingham, Leeds, Carlisle, and Chester. In this, however, may be traced only the operation of influences which are still more active among the civil populations, and which depend upon peculiarities of soil—low marshy situations, sluggish sewerage, and the like—conditions either wholly or in part beyond the control of the health officer. With one exception I have no requirements to specify which are essential to the improvement of the sanitary state of any of the Military Establishments in the district, so well in general are the ventilation, warming, lighting, and draining of the various barracks attended to.

The exception referred to is that of a drain in the foreshore at Fleetwood, which seems to have been either too short originally, or to have been banked off from the tide by sand deposits, for, opening out upon the beach not many yards from the sea front of the Euston Barracks, it is reported as very offensive when the wind is from a westerly quarter. This has been duly represented, and an extension of the drain beyond low-water mark is ordered to be included in the Estimates for the ensuing year.

Other minor improvements have been from time to time suggested to the authorities, and whenever within practicable limits of expense, invariably effected. Subjoined is a list of the chief sanitary services that have been carried out in the Northern District in 1869–70 :—

1. *Leeds.*—Canteen privy converted into water latrine. 2. Bath room; fitting up a second bath.

3. *Paull Point.*—Raising night urinals.

4. *Ashton.*—Hospital; setting ventilating grates, and providing air-shafts, &c.

5. *Burnley.*—Officers' watercloset improved.

6. *Bury.*—Cookhouses and washhouses; providing additional ventilation.

7. *Castletown (Isle of Man).*—Hospital; improving and ventilating shaft. 8. Women's washouse; providing stands for tubs, and foot gratings, &c. 9. Laying on water to urinals. 10. Raising floor of privies from cesspool.

11. *Chester.*—Soldiers' rooms; providing ventilating grates. 12. Erecting baths in ablution houses—one in each room.

13. *Hulme.*—Prisoners' room and cells; additional ventilation.

14. *Preston.*—Infantry Officers' mess and ante-room; improving ventilation. 15. Drainage; constructing filters.

16. *Birmingham.*—Officers' stables; improving ventilation.

17. *Coventry.*—Re-constructing serjeants' and women's latrines.

18. *Northampton.*—Barracks; generally improving drainage. 19. Canteen yard; improving privy and urinal.

20. *Weedon.*—Upper barracks; providing six improved urinals. 21. Ordnance Row; providing three improved urinals.

22. *Birmingham.*—Improving barrack cells.

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23. *Ashton.*—Draining of barracks, &c.

There is no station within the district where the Contagious Diseases Act, or any local ordinance of the kind, is in force, though greatly wanted in many, and notably so in Manchester and Salford.

North Britain.

Deputy Inspector-General Home reports:—

One-third of the Force only served a complete year in the Command, the remainder having at intervals arrived from stations either at home or abroad. No observations, therefore, can be made on the sanitary effects of the climate of Scotland upon the troops included in this Report.

Here, as at all stations at home, the great cause of sickness and inefficiency has been venereal disease. Under one form or another it has constituted about one-third of the whole admissions. I recommended that the ablution rooms should be lighted at night in order that the men in returning to their quarters might have it in their power to avail themselves of all the protection cleanliness could afford. This recommendation, although it met with the approval and support of the Major-General Commanding, was ultimately rejected at the War Office, on account of the expense which its being carried out would have occasioned.

Chest complaints have this year been unusually prevalent at some of the stations in the Command, which, perhaps, may be sufficiently accounted for by the severity of the weather this winter, and the damp and changeableness of this northern climate.

The Surgeon of the 17th Lancers, desirous of counteracting as much as possible the exposure of his men when at stables, especially on going from these to their barrack rooms, very judiciously recommended their being provided with loose serge jackets to wear when at stable duty. This having been sanctioned, has become an established regimental arrangement, the expense being borne in equal proportion by the Canteen Fund and the men themselves.

It might be considered whether a similar regulation could not advantageously be adopted by the whole of the Cavalry serving in the United Kingdom.

Glasgow.—The lowness of the old barrack rooms (9 feet), their imperfect ventilation, the rottenness of much of the timber composing them, together with the myraids of rats, with which they are infested, is considered by the Surgeon of the 5th Fusiliers as very likely to increase the severity of any epidemic that might happen to occur there. As new barracks, however, are in the act of being constructed at a little distance from the town, the authorities are naturally unwilling to lay out money in improving the old ones.

The hospital, like the barracks at Glasgow, is by no means what it should be, the ventilation of the wards being much complained of by the Medical Officer at present stationed there. Each ward, however, having two fireplaces, the sick are not likely to suffer materially before the building in the new barracks intended for their reception is completed.

Hamilton.—The Assistant Surgeon, 17th Lancers, stationed here, directs attention to the imperfect ventilation of the stables, in which the men spend about 4 hours daily, and breathe an atmosphere strongly charged with ammonia and other animal exhalations. This subject, as bearing on the health of the Cavalry soldiers, is deserving of consideration, and as regards the particular barracks here referred to, will receive my careful attention on the occasion of my next inspection at Hamilton.

A lavatory for the patients is much wanted in the hospital at Hamilton, the washhouse there being now used for the purpose. After a lengthened representation of this necessity the sum of 46*l.* has at length been granted properly to fit up and equip the above-mentioned washhouse as a lavatory.

At this station also the sanitary improvement of converting the old-

fashioned privies into Macfarlane's latrines is now going on, an alteration on which 35*l.* which has been allowed for the purpose, will be well expended.

Ayr.—I have repeatedly had occasion to represent, through the Military Authorities, the great need there is for a bath and ablution room being constructed in the hospital. The Commanding Royal Engineer had, by direction of the Major-General Commanding, included this in the estimates last drawn up, but no intimation has as yet been received of its being sanctioned by the War Office.

Dundee.—A bath room is greatly wanted, the men having nothing but basins in which to perform their ablutions. The construction of an oven, also, in the cookhouse, is likewise much needed in these barracks, where no means now exist of varying the cooking of the rations. Both of these deficiencies have been strongly brought to the notice of the Major-General Commanding.

Paisley.—The greatest sanitary improvement effected in the Command during the last year, has been the carrying out of a general system of ventilation of the barracks, hospital and guard-room, at this station, on which the sum of 320*l.* has been expended

Diet.—The only improvement in this respect, adverted to by any of the Medical Officers in their Sanitary Reports, has been that introduced into the 17th Lancers, in which regiment every man now receives, gratuitously, a cup of coffee in the morning before going to his stable duty; the same is also given to every soldier on guard at 11 o'clock at night, the charge for the whole being borne by the Canteen Fund. Such an arrangement cannot but conduce materially to the health of the men.

IRELAND.

Inspector-General Dane reports:—

The health of the troops has been more satisfactory at the Curragh, and less so in the northern than in the south-western districts.

No doubt the unsettled state of the country, causing an incessant demand for the movement of troops, has been a chief cause of the sickness; but the defective accommodation at many stations in the command, and constant variations in the climate, have largely aided in inducing disease.

Details of the improvements effected in a sanitary point of view, and the list of services ordered to be carried out, as well as those recommended, appear in the district reports. I can only add that there has been an evident desire on the part of the military authorities to carry out any recommendation emanating from the department; and if defects still exist, the cause has been want of funds to make the alterations.

Much attention has been paid to the important question of the water supply. Analysis at Netley Hospital has shown that the quality was bad at several stations; and the necessity for an improved supply has been the subject of representation; and, *I believe, action will be taken* to remedy the defects.

The erection of a Lock Hospital at Cork seems to have had a beneficial influence in reducing the number of admissions for venereal in that locality, but there has not been sufficient time to form any correct judgment as to the value of the late enactments on this subject.

It does not appear that the erection of night ablution rooms for the men in some barracks has answered the expectation formed.

The establishment of a Lock Hospital, and the enforcement of the provisions of the Act for the prevention of this malady, are, I think, much required in the garrison of Dublin.

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Dublin Division.

Deputy Inspector-General J. H. Ker Innes, C.B., reports:—

Throughout the division there has been less fever amongst the civil population than during the preceding year; nevertheless, the admissions from this cause amongst the troops correspond very closely in numbers to those returned in 1868.

The prevalence of scarlatina was remarkable during the latter portion of the year chiefly in Dublin and Enniskillen, and measles has largely prevailed at Newry, as well as at Richmond and Portobello Barracks in Dublin. In the last named station, the 1st Battalion 17th Regiment yielded a very considerable proportion of cases amongst their married families, and it was considered desirable to remove those who had not become affected to the Curragh Camp, in order that the troops might be in readiness to embark for India early in 1870.

The duties of the troops have not usually been severe, but a number of detached parties had to be employed in aid of the Civil power during the elections, whilst severe weather prevailed, and the exposure in some instances was productive of an increase of sickness.

During the year, considerable improvements have been introduced into the Royal Barracks, Dublin, whereby their capacity and ventilation have been much increased.

The hospital accommodation throughout the garrison has been re-appropriated, and each patient can now claim 1,200 cubic feet of space. The ventilation of the hospital at Arbour Hill has also undergone improvement.

In the district, however, there is much overcrowding, and the efforts of the Medical Officers are very constantly directed towards reducing its amount, and in mitigation of the evils attendant upon it; in some few of the barracks improved cooking ranges have been erected, and water latrines have been made to replace the prevailing cesspit.

The drinking water at some of the out-stations is saline, and therefore impure. Representations have been made from Dundalk, and it is intended to introduce an extraneous supply. At Enniskillen one well alone (in the Castle Barracks) supplies potable water, and even this is liable to be tainted by the existence of a circular enclosure for the reception of ashes and other refuse close to it; its removal has repeatedly been urged.

The following are the principal sanctioned sanitary improvements in contemplation for 1870-71:—

Royal Barracks.—Further enlargement of quarters, and enlarging windows on the west side of barracks.

Island Bridge.—Improvement of ablution rooms.

Pigeon House Fort.—To lay on water from Kings-end.

Athlone Military Prison.—Convert latrines into waterclosets.

Boyle.—Improved ventilation in barrack rooms.

Galway.—Improved ovens.

The prevalence of venereal disease has been lamentably great. In certain of the out-stations the complaint has been comparatively rare amongst some of the detachments quartered there. This was the case at Newry for a long period.

At Richmond Barracks, Dublin, a night ablution room has been erected, but a careful examination of the returns does not indicate any diminution in the number of admissions for either gonorrhœal or syphilitic affections since it has been opened. Its situation is of necessity somewhat exposed, and it does not appear to be used by the troops, through a false sense of shame.

The Curragh Camp and District.

Surgeon-Major Evans reports:—

The amount of sickness and mortality in the aggregate, as also in respective corps, has been small, and shows a decrease compared with the previous year.

The Medical Officer in charge of the 66th Regiment attributes the greater

proportion of chest affections in that corps to the cold of the huts and the exposed position of the camp.

I am, however, of opinion that the larger proportion of chest diseases in that corps is attributable to the fact of there being a very large number of recruits and young soldiers in the regiment, which has been recently recruiting up to the Indian strength. In other regiments stationed at the Curragh during the winter months there was no unusual amount of chest affections.

The sanitary condition of the camp and Newbridge stations has been good during the year.

Sanitary Improvements.

Services carried out during the past year:—

Lock hospital, Kildare, opened 6th December, 1869. Water laid on to Slaughter-house, Curragh.

Services which will be completed 31st March, 1870:—

Curragh Camp.—Re-construction of abattoir. Revision and re-distribution of surface drainage. Moule's earth closet in Field and Staff Officers' quarters.

Newbridge.—Converting women's washhouse into lavatory. Building water-closets within the hospital.

Services inserted in Barrack Annual Estimates 1870–71 :—

Curragh Camp.—Enlarge latrines—eastern bakery. Cleaning out main drain of camp.

Newbridge.—Re-arrange latrines and ablution rooms. Increased water supply and improved drainage.

Venereal Diseases.—The Contagious Diseases Act is in force, and a Lock hospital was opened at Kildare on the 6th December, 1869.

There are night ablution rooms in "B" Lines, in which the 66th Regiment was stationed during the whole year. They came into use in March 1869. There has neither been special immunity from, nor special spread of, venereal during the period. The Lock hospital having been opened but three weeks previous to the close of the year, no perceptible benefit could be expected from the Act as yet. The average proportion of venereal in the 66th Regiment was not less than in other corps, consequently there was not any apparent benefit derived from the night ablution house.

No epidemic diseases prevailed at the Curragh or Newbridge stations during the year, nor does there appear to have been any unusual prevalence of disease of any description which could be attributed to atmospheric influences.

Cork District.

Deputy Inspector-General Prendergast reports :—

The recurrence of cases of typhoid and other low fevers at Buttevant from time to time was imputed by Medical Officers to the very insanitary state of the old cesspit latrines, now no longer in existence, Moule's system having been substituted. The old latrines were bad, but I consider the impure drinking water then used by the troops and obtained from some of the barrack wells as having been a more likely cause of disease. Samples from each pump were subjected to analysis at Netley in October last, and the water from three of the pumps was pronounced unfit for drinking purposes, and the use of one prohibited altogether.

Templemore.—At this station, the Medical Officer in charge considered that many cases of diarrhœa, &c., were caused by impure drinking water obtained form barrack pumps; the matter was immediately reported, and samples of water sent to Netley for analysis. Of these, only one was considered fit for drinking purposes—that from the "artesian well," and of this it is remarked, "the water is very hard, and the volatile matter considerable, but is an usable "water if better cannot be provided." On the receipt of the report, the use of water for drinking purposes from the five other pumps was interdicted. Virtually, the troops at Templemore are restricted to one well for drinking,

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and this of a doubtful character. So far back as 1861 the water was the subject of correspondence, and by an analysis then made by the War Office Analyst, some of the wells were pronounced unfit for drinking purposes.*

Fermoy and Waterford.—During summer seasons, and especially those of drought, the supply of water at these stations is often deficient. At the former an unlimited supply is at hand, but its utilization would be attended with much expense, owing to the position of the barracks (above the River Blackwater). The old cesspit system of latrines prevails throughout the district, and requires to be superseded by a more modern system of conservancy (this applies to urinals also). "Moule's" earth closets have within the past year been erected at Buttevant with marked sanitary advantage.

At Cork new latrines are to be erected next year, the drainage in connection with them being now nearly completed.

The latrines most urgently requiring remodelling are those of Fermoy, Ballincollig, Kilkenny, Waterford (Infantry barracks), Clonmel, Tralee, Carrick-on-Suir, and Cahir.

The erection of quarters for married families is much required throughout the district. In many barracks, the over-crowding of married families is great, and opposed to all sanitary and moral principles.

Married quarters are about being built at Cork, where they are indeed much required.

Hospitals for the treatment of contagious diseases among women and children are much needed, as without such, or the removal of the sick into civil hospitals, it is impossible to prevent the spread of infection. Dr. Davidson, 56th Regiment, states that "scarlet and continued fever have been prevalent, "in the regiment during the year, the supposed cause being over-crowding "of the men at the Curragh, and defective ventilation at Ship-street Bar-"racks, Dublin.

Cork General Hospital.—Some sanitary defects in No. 2 Ward, E Block, have been brought to the notice of the Commanding Officer Royal Engineers.

Carrick-on-Suir.—The Medical Officer in charge reports the defective state of the ablution room, and the want of baths. If the station is to be permanently occupied, additional hospital accommodation should be provided. The very unsatisfactory means of cooking at the hospital ought to be remedied, as also the want of a hospital latrine or watercloset.

Charles Fort, Kinsale.—No bath and ablution accommodation. This item is included in Estimates for 1870–71.

Fermoy.—Ventilation in the old barracks at Fermoy much required. Included in Estimates for 1870–71.

Many of the guard-rooms throughout the district require reconstruction or otherwise enlarging.

Modern system of urinals, supplied with separate taps, to each barrack, prison, and guard-room throughout the district, is much required. The custom of urine tubs should be done away with on sanitary grounds, for after a few days use they always become more or less offensive. The addition of a tap to each urinal for private ablution is also desirable, as a preventive against venereal diseases.

In each prisoner's room of this district, there should be a tap in connection with the urinal, and private ablution should be made compulsory on each man being confined. Such a custom properly carried out would, I am certain, tend much towards the prevention of venereal disease.

Sanitary improvements during the year.

1. The erection of Moule's earth closets at Buttevant has effected a great sanitary improvement.
2. An extensive system of drainage in connection with the re-modelling of the latrines at Cork is being effected.
3. Levelling and preparing for the erection of married quarters at Cork.
4. Ventilation of barracks at Tralee, partly completed.
5. Ablution room at Kinsale being completed.

* Provision for an improved water supply has been made in the estimates for 1871–2.

6. Modern kitchen range in hospital kitchens put up at Kinsale and Charles Fort.

7. Modern cooking range erected at Carrick-on-Suir.

8. Prisoners room at Cork, which much needed additional light and ventilation, now being remedied.

Besides the above, many sanitary improvements have been effected here and there through this large district.

Lock Hospital.—Since June last, a Lock Hospital under the operations of the "Contagious Diseases Act" has been opened. This hospital contains 46 beds, all of which have been constantly occupied.

Section II.

On the Extent of Invaliding.

The following Table shows the number of invalids discharged the Service from the troops serving in the United Kingdom during the year 1869, and the number from each arm of the Service :—

	Troops generally.	Household Cavalry.	Dragoon Guards and Dragoons.	Royal Artillery (including the Depôt Brigade).	Military Train.	Foot Guards.	Infantry Regiments.	Depôt Battalions.	Royal Engineers and Departmental Corps.
Strength	73,764	1,216	7,923	10,310	1,644	5,642	31,541	10,686	3,995
1869.. Number discharged as Invalids	2,646	28	233	428	78	147	964	501	74
1869.. Ratio per 1,000 ..	35·87	23·03	29·40	41·51	47·43	26·05	30·56	46·88	18·52
1860–68, Ratio per 1,000	33·86	15·24	29·38	25·17	23·19	27·80	28·49	39·42	8·42*

* For two years only.

The discharges by invaliding have been considerably higher than in 1868, a result, probably, of the reductions which have been taking place during the year. They have exceeded the average of the last nine years, except in the Cavalry of the Line and the Foot Guards. The high ratio in the Military Train was probably due to its re-organization under the Control Department, and the increase in the Depôt Battalions may also have been connected with the changes which were to be carried out with regard to them in the following year. As in the preceding year, the proportion invalided for phthisis was much higher in the Household Cavalry and Foot Guards than in any of the other arms.

Section III.

On the Number constantly Sick in Hospital of the Troops serving in the United Kingdom.

The following Table shows the proportion per 1,000 of strength constantly non-effective from sickness of the troops generally, and in each arm of the Service, with the average sick time to each soldier, and the average duration of the cases :—

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		Troops generally.	Household Cavalry.	Cavalry of the Line.	Royal Artillery.	Military Train.	Foot Guards.	Infantry Regiments.	Depôt Brigade Royal Artillery.	Depôt Battalions.
Mean daily sick per 1,000 of strength ..	1869.	40·82	27·55	38·32	42·52	33·61	43·18	42·65	44·79	47·64
	1860-8	48·55	31·20	41·54	48·64	48·41	51·11	42·18	58·86	47·49
		Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.
Average sick time to each Man in the course of the Year	1869	14·90	10·05	13·99	15·52	12·27	15·76	15·57	16·35	17·39
	1860-8	17·21	11·39	15·16	17·75	17·67	18·65	15·39	21·49	17·34
Average duration of the Cases	1869	18·69	18·81	19·01	19·57	23·64	24·59	21·26	15·90	19·09
	1860-8	18·54	18·42	17·34	18·80	18·47	22·73	18·83	19·56	17·89

The proportion constantly sick, and the average sick time to each soldier serving, have been under the average of the preceding nine years among the troops generally, and in each arm, except the Infantry regiments and Depôt Battalions which have furnished almost exactly the average. The mean duration of the cases has been above the average of the preceding periods, a result which would lead to the inference that the reduction in the admissions shown in the preceding pages had been chiefly in diseases of minor importance, and which require but a short period of hospital treatment.

Section IV.

On the Influence of Age on the Mortality of Troops serving in the United Kingdom.

The mortality at different ages, arranged in quinquennial periods of life, in the various arms of the Service, is shown in the following Table compiled from Abstract No. 3 in the Appendix :—

Corps.	Annual Ratio of Deaths per 1,000 Living, at the following Ages :—					
	Under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and upwards.
Household Cavalry	..	2·83	19·73	5·52	..	16·94
Cavalry of the Line	2·87	5·97	5·75	11·74	17·68	12·71
Royal Artillery	3·67	4·98	13·02	13·83	11·20	21·58
Military Train	..	3·95	14·17	12·77	..	47·61
Foot Guards..	2·29	7·27	5·87	11·62	21·48	11·62
Infantry Regiments	2·71	4·74	6·09	12·27	15·02	26·16
Depôt and Coast Brigades Royal Artillery, and Depôt Battalions..	3·24	6·28	9·57	21·30	22·37	22·97
Ditto, ditto, 1859-67	5·12	8·96	11·93	17·46	23·64	28·89
Average of preceding, exclusive of all Depôts..	2·73	5·22	7·24	12·31	14·59	20·13
Ditto, ditto, 1859-67	3·08	5·79	7·70	12·34	15·88	18·40
Civil Male Population — England and Wales ..	7·41	8·42	9·21	10·23	11·63	13·55
Civil Male Population — Healthy Districts. ..	5·83	7·30	7·93	8·36	9·00	9·86

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Compared with the results for 1868, this Table shows a slight decrease in the mortality at all ages under 40 in the Troops, exclusive of Depôts, and at all ages above 20 in the Depôts. Under 30 years of age the mortality, exclusive of Depôts, is below that of the civil male population in healthy districts, but above that age it considerably exceeds it, a result, doubtless, of the deterioration caused by service in unhealthy climates.

Section V.

On the Recruiting of the Army.

In the beginning of October, an important alteration was made in the system of dealing with recruits deemed unfit for service at secondary inspections. The practice of assembling a Medical Board to decide upon the fitness of the recruit was abolished, and the decision of the District Staff Surgeon was made final in *all* cases when the man had been previously passed by a civilian medical practitioner, and submitted to the Adjutant-General for approval when passed primarily by a military Medical Officer. In case of a district recruit being objected to by the Surgeon of his regiment on joining, and the objection being considered valid by the Principal Medical Officer of the District, the case is reported through the Commanding Officer to the Adjutant-General for final decision. It is probable that this alteration may exert some influence on the numbers rejected at secondary inspection, but owing to the short time it was in operation in 1869, it can scarcely be appreciable in the results for that year. The Principal Medical Officer of each District was instructed to examine carefully from time to time during training, and report to the Director-General his opinion of the quality of the recruits joining the various Corps in his Division; and so far as these reports may be accepted as evidence of the working of the change, it appears hitherto to have been very satisfactory.

The number of recruits reported to have been primarily inspected was 7,352 at the head-quarters of recruiting districts, 6,075 at regiments and depôts, and 4,322 by civilian medical practitioners, making a total of 17,749. The rejections at the primary inspections amounted to 6,083, and at the secondary to 577, or a total of 6,660. These numbers give the proportion of 375 rejected per 1,000 primarily inspected, a result almost identical with that of the preceding year.

The following Table shows the results in each class of recruits.

	Number of Recruits Primarily Inspected.	Number Rejected.			Ratio of Rejections per 1,000 Examined.	
		Primary Inspections.	Secondary Inspections.	Total.	Primary Inspections.	Primary and Secondary Inspections.
At Head-Quarters of Recruiting Districts	7,352	2,790	196	5,088	379·5	378·9
At Regiments and Depôts	6,075	2,102			346·0	
By Civil Medical Practitioners ..	4,322	1,191	381	1,572	275·6	363·7
Total	17,749	6,083	577	6,660	342·7	375·2

Compared with the corresponding Table for 1868, this shows a slight decrease in the proportion of primary rejections in the recruiting districts, and a slight increase at the regiments and depôts, but the general result is

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identical in the two years; there has been a slight increase in the proportion rejected by civilian medical practitioners, but a decrease in the proportion of their recruits rejected at secondary inspection, resulting in a slight decrease in the total proportion rejected.

The number of recruits inspected, and the proportion rejected at primary and secondary inspections in each of the Recruiting Districts are shown in the following Table framed from Abstract No. 4 in the Appendix:—

Districts.	Total Number Inspected.		Ratio found Unfit per 1,000 Inspected.	
	Primary Inspections.	Secondary Inspections.	Primary Inspections.	Secondary Inspections.
London	4,083	1,670	373	61
Liverpool	1,221	228	404	236
Bristol	317	416	460	141
York	50	390	340	125
Glasgow..	659	134	511	149
Dublin	553	125	316	64
Belfast	469	185	211	59
Total.. ..	7,352	3,148	379	96
Ratio in 1868	..	..	384	119

There has been a trifling decrease in the proportion rejected at primary, and a considerable one at secondary inspections. Glasgow still continues to furnish the highest proportion of rejections, and in Bristol and Liverpool it was considerably above the average. Belfast had the lowest ratio of rejections.

The following Table shows the native countries of the recruits inspected, and of those rejected during the year:—

Native Countries of Recruits.	Head-Quarters of Recruiting Districts.		Head-Quarters of Regiments and Depôts.		By Civil Medical Practitioners.		Subsequently Rejected on Secondary Inspection.		Total.		Proportion Rejected per 1,000 Inspected.
	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.	Of those who had been found fit by Army Surgeons.	Of those who had been found fit by Civilians.	Primarily Inspected.	Rejected at Primary and Secondary Inspections.	
England	4,928	1,897	4,606	1,590	3,594	1,020	140	325	13,128	4,972	378·7
Wales	117	38	67	17	93	30	5	6	282	96	340·4
Scotland	582	272	628	229	102	18	27	15	1,312	561	427·6
Ireland	1,681	570	709	250	511	118	23	34	2,901	995	343·0
British Colonies and Foreign Countries ...	44	13	65	16	17	5	1	1	126	36	285·7
Total ...	7,352	2,790	6,075	2,102	4,322	1,191	196	381	17,749	6,660	375·2

This Table shows an increase in the proportion rejected of the English and Scotch recruits, and a decrease in all the others. The difference is most marked in the Welsh, but the number enlisted of the natives of that portion of the kingdom is so small, that great fluctuations in the results might be naturally expected.

The proportion of recruits furnished by each country in every 1,000 inspected, has been as follows:—

By England and Wales	686·2	*United Kingdom.*
Scotland	79·2	
Ireland	228·6	
Colonies and Foreign Countries	6·0	

These ratios show a considerable increase in the Irish recruits, and a decrease in the other classes.

The numbers inspected for each arm of the service, and the proportion rejected are shown in the following Table :—

	Head-Quarters of Recruiting Districts.		Regiments and Depot Battalions.		Inspected by Civil Medical Practitioners.		Total Primary Inspections.		Rejected on Secondary Inspection.	Total.		Ratio of Rejections per 1,000 Recruits Inspected.
	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.		Inspected.	Rejected.	
Household Cavalry	...	...	196	102	...	...	196	102	6	196	108	551·0
Cavalry of the Line and Military Train	972	372	505	142	179	42	1,656	556	28	1,656	584	352·6
Royal Artillery and Engineers	973	316	1,391	417	864	177	3,228	910	91	3,228	1,001	310·1
Foot Guards	80	43	134	44	530	179	744	266	144	744	410	551·0
Infantry Regiments and Depots	5,327	2,059	3,949	1,397	2,749	793	11,925	4,249	308	11,925	4,557	382·1
Total	7,352	2,790	6,075	2,102	4,332	1,191	17,749	6,083	577	17,749	6,660	375·2

Compared with the results for 1868, this Table shows a very marked increase in the rejections for the Foot Guards, and a slight increase in those for the Household Cavalry, and Cavalry of the Line, while there has been a slight decrease in the rejections for the Artillery and Infantry.

In the following Table the disabilities for which the recruits were rejected are shown in a classified form :—

RETURN showing the Number of Recruits Rejected during the Year 1869, with the Causes arranged in Classes, and the Ratio per 1,000 in each Class.

Class.	Causes of Rejection, in Classes.	Primary Inspections.								Rejected on Secondary Inspection.		Total Rejected on both Primary and Secondary Inspection.					
		At Head-Quarters of Recruiting Districts.		At Head-Quarters of Regiments & Depôts.		By Civil Medical Practitioners.		Total.		Of Recruits previously examined by Army Medical Officers.	Of Recruits previously examined by Civilians.	Of Recruits examined by Army Medical Officers.		Of Recruits examined by Civil Medical Practitioners.		Total.	
		7,352		6,075		4,322		17,749				13,427		4,322		17,749	
		Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.			Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.
1	Syphilis	91	12·38	99	16·30	76	17·59	266	15·00	10	15	200	14·90	91	21·05	291	16·40
2	Scrofula	60	8·16	46	7·57	31	7·17	137	7·72	3	6	109	8·12	37	8·56	146	8·23
3	Phthisis	31	4·22	53	8·72	26	6·02	110	6·20	3	12	87	6·48	38	8·79	125	7·04
4	Impaired Constitution	38	5·17	22	3·62	6	1·39	66	3·72	1	7	61	4·54	13	3·00	74	4·17
5	Muscular Tenuity and Debility	296	40·30	217	35·72	104	24·07	617	34·77	23	47	536	39·92	151	34·93	687	38·71
6	Other General Diseases	35	4·80	42	6·91	8	1·85	85	4·79	5	6	82	6·11	14	3·23	96	5·41
7	Diseases of the Nervous System	6	·81	13	2·14	1	·23	20	1·12	..	..	19	1·41	1	·23	20	1·12
8	Weakness of Intellect	5	·68	6	·99	2	·46	13	·73	..	2	11	·81	4	·92	15	·84
9	Diseases of Eyes and Eyelids	294	40·00	212	34·90	139	32·16	645	36·34	29	37	535	39·85	176	40·72	711	40·06
10	Diseases of Nose and Mouth	11	1·49	5	·82	4	·92	20	1·12	..	1	16	1·19	5	1·15	21	1·18
11	Disease of Ears	14	1·90	1	·16	2	·46	17	·96	..	1	15	1·11	3	·69	18	1·01
12	Deafness	21	2·86	7	1·15	2	·46	30	1·69	..	2	28	2·09	4	·92	32	1·80
13	Impediment of Speech	20	2·72	6	·99	4	·92	30	1·69	1	3	27	2·01	7	1·61	34	1·92
14	Disease of Heart	170	23·12	171	28·15	89	20·60	430	24·23	18	43	359	26·74	132	30·54	491	27·66
15	Disease of Arteries (Aneurism)	1	·13	1	·16	3	·69	5	·28	1	..	3	·22	3	·69	6	·34
16	Disease of Veins (Varix)	231	31·42	215	35·40	112	25·92	558	31·44	10	33	456	34·00	145	33·55	601	33·86

RETURN, &c.—*continued.*

Class.	Causes of Rejection, in Classes.	Primary Inspections.								Rejected on Secondary Inspection.		Total Rejected on both Primary and Secondary Inspection.					
		At Head-Quarters of Recruiting Districts.		At Head-Quarters of Regiments & Depôts.		By Civil Medical Practitioners.		Total.		Of Recruits previously examined by Army Medical Officers.	Of Recruits previously examined by Civilians.	Of Recruits examined by Army Medical Officers.		Of Recruits examined by Civil Medical Practitioners.		Total.	
		7,352		6,075		4,322		17,749				13,427		4,322		17,749	
		Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.			Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.
17	Disease of Lungs (except Phthisis) ..	57	7·75	21	3·46	26	6·02	104	5·86	2	1	80	5·96	27	6·24	107	6·02
18	Loss or Decay of many Teeth	97	13·19	87	14·32	16	3·70	200	11·27	4	5	188	14·00	21	4·85	209	11·78
19	Hernia	72	9·79	62	10·20	90	20·83	224	12·62	10	11	144	10·73	101	23·36	245	13·81
20	Laxity of Abdominal Rings	59	8·02	36	5·93	13	3·01	108	6·08	1	6	96	7·15	19	4·39	115	6·48
21	Hæmorrhoids	41	5·58	6	·99	7	1·62	54	3·04	..	..	47	3·50	7	1·61	54	3·04
22	Diseases of the Urinary Organs	3	·40	6	·99	3	·69	12	·67	..	..	9	·67	3	·69	12	·68
23	Varicocele	158	21·49	126	20·74	127	29·40	411	23·16	16	20	300	22·34	147	34·01	447	25·19
24	Other Diseases of the Genital Organs (not Syphilitic)	13	1·77	8	1·32	15	3·47	36	2·03	1	..	22	1·64	15	3·47	37	2·08
25	Defects of Upper Extremities, from Fracture, Contraction, Luxation, &c. ..	91	12·38	50	8·23	15	3·47	156	8·79	9	12	150	11·17	27	6·24	177	9·97
26	Defects of Lower Extremities, from Fracture, Contraction, Luxation, &c. ..	275	37·40	132	21·73	51	11·80	458	25·80	11	31	418	31·13	82	18·97	500	28·17
27	Flat Feet	75	10·20	100	16·46	39	9·02	214	12·06	5	11	180	13·40	50	11·56	230	12·96
28	Diseases of Joints	9	1·22	16	2·64	9	2·08	34	1·92	..	5	25	1·86	14	3·23	39	2·20
29	Other Affections of Bones and Muscles ..	11	1·49	18	2·96	3	·69	32	1·80	1	2	30	2·23	5	1·15	35	1·97
30	Ulcers, Wounds, and Cicatrices	82	11·15	36	5·93	32	7·40	150	8·45	7	7	125	9·31	39	9·20	164	9·24

RETURN, &c.—*continued.*

Class.	Causes of Rejection, in Classes.	Primary Inspections.								Rejected on Secondary Inspection.		Total Rejected on both Primary and Secondary Inspection.					
		At Head-Quarters of Recruiting Districts.		At Head-Quarters of Regiments & Depôts.		By Civil Medical Practitioners.		Total.		Of Recruits previously examined by Army Medical Officers.	Of Recruits previously examined by Civilians.	Of Recruits examined by Army Medical Officers.		Of Recruits examined by Civil Medical Practitioners.		Total.	
		7,352		6,075		4,322		17,749				13,427		4,322		17,749	
		Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.			Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.	Number Rejected.	Ratio per 1,000.
31	Other Affections of the Cutaneous System.	47	6·39	25	4·12	22	5·09	94	5·30	2	..	74	5·51	22	5·09	96	5·41
32	Malformation of Ears	1	·13	5	·82	..	..	6	·33	..	..	6	·44	..	..	6	·34
33	,, Nose and Mouth.. ..	6	·81	4	·66	..	..	10	·56	..	..	10	·74	..	..	10	·56
34	,, Chest and Spine	239	32·50	151	24·86	99	22·91	489	27·55	12	36	402	29·94	135	31·23	537	30·26
35	,, Urinary or Genital Organs	..	..	..	..	1	·23	1	·05	..	..	..	..	1	·23	1	·05
36	Marks of Punishment or letters D or B C..	18	2·44	13	2·13	3	·69	34	1·92	3	1	34	2·53	4	·92	38	2·14
37	Marks of Cupping, Blistering, &c... ..	112	15·23	58	9·55	11	2·54	181	10·20	8	17	178	13·26	28	6·47	206	11·61
	Not specified	..	..	26	4·27	..	..	26	1·46	..	1	26	1·93	1	·23	27	1·52
	Total	2790	379·49	2102	346·01	1191	275·57	6,083	342·72	196	381	5088	378·94	1572	363·72	6,660	375·23

United Kingdom

These results do not differ materially from those of the preceding year, except that there has been a marked increase in the proportion rejected for muscular tenuity and debility, which now holds the second place in point of frequency as a cause of rejection. As in 1868, diseases of the eyes and eyelids have been the most frequent cause, muscular tenuity and debility, varix, malformations of chest and spine, defects of lower extremities, disease of heart, and varicocele following in succession.

On examining the causes of rejection by Army Medical Officers and civilian medical practitioners respectively, the most striking point of difference is the high proportion rejected by the former for muscular tenuity and debility, loss or decay of many teeth, defects of lower extremities, and marks of cupping, blistering, &c., and by the latter for hernia and varicocele.

The following Table, framed from Abstract No. 6 in the Appendix, shows the proportion of recruits at each age in every 10,000 examined :—

Proportion in 10,000 Examined.	Boys under 17.	17 to 18.	18 to 19.	19 to 20.	20 o 21.	21 to 22.	22 to 23.	23 to 24.	24 to 25.	25 and upwards.
At Head Quarters of Recruiting Districts ..	155	805	3,003	2,050	1,106	943	694	624	441	179
At Regiments and Depôts ..	477	1418	2,556	1,867	1,115	871	673	540	344	139
By Civil Medical Practioners	60	548	3,219	2,207	1,365	919	791	504	331	56
Total ..	242	952	2,903	2,026	1,172	912	710	567	381	135

There was a marked increase in the proportion inspected between the ages of 18 and 20, and a decrease at all the other ages.

The proportion of recruits at each height is shown in the following Table, prepared from Abstract No. 7 in the Appendix :—

Proportion in 10,000.	Inspected at Head-Quarters of Recruiting Districts.	Inspected at Regiments and Depôts.	Inspected by Civil Medical Practitioners.	Total.
Ft. In. Ft. In.				
Under 5 3 ..	166	402	51	218
5 3 to 5 4 ..	62	62	16	53
5 4 „ 5 5 ..	369	461	444	418
5 5 „ 5 6 ..	998	1,241	643	994
5 6 „ 5 7 ..	3,613	2,664	3,038	3,149
5 7 „ 5 8 ..	2,131	2,153	2,467	2,221
5 8 „ 5 9 ..	1,445	1,457	1,539	1,472
5 9 „ 5 10 ..	695	722	1,076	797
5 10 „ 5 11 ..	302	349	414	345
5 11 „ 6 0 ..	146	231	224	194
6 0 and upwards	73	258	88	139

There has been a marked decrease in the proportion under 5 ft. 6 in., due to the standard having been raised. Upwards of half the recruits inspected were between 5 ft. 6 in. and 5 ft. 8 in.

The following Table shows the proportion of men of different weights inspected at Head-Quarters of Recruiting Districts during the year. The numbers at each weight are stated in Abstract No. 8 in the Appendix ;—

United Kingdom.

	lbs.		lbs.					
Under	100			..	..	..	..	129
From	100	to	110	..	..	..	..	136
„	110	to	120	..	..	..	..	1,122
„	120	to	130	..	..	..	..	2,899
„	130	to	140	..	..	..	..	2,707
„	140	to	150	..	..	..	..	1,923
„	150	to	160	..	..	..	..	755
„	160	to	170	..	..	..	..	242
„	170 and upwards			..	..	..	..	87
								10,000

As might have been anticipated from the reduction in the number of men under 18 years of age and under 5 ft. 6 in. in height, there has been a marked decrease in the proportion of men of the lighter weights. This is evident up to 130 lbs., while there is a corresponding increase in all the groups above that weight.

The state of education among the recruits inspected at the Head-Quarters of Recruiting Districts, and at the Regiments and Depôts, is shown in the following Table, framed from No. 9 in the Appendix; there is no available information on the subject as regards recruits inspected by civilian medical practitioners:—

Of every 1,000 Recruits Examined.	Unable to Read or Write.	Able to Read only.	Able to Read and Write.
At Head-Quarters of Recruiting Districts	226	67	707
At Regiments and Depôts	132	91	777
Total	183	78	739

Compared with the results for 1868, this Table shows a decrease in the proportion unable to read or write inspected at the Recruiting Districts, but it has been identical in the two years at the Regiments and Depôts. There has been a slight decrease in the number able to read only. There has been a greater increase in the proportion able to read and write at the Head-Quarters of Districts, but it is still considerably lower than among the recruits inspected at the Regiments and Depôts.

The following Table shows the occupations of the recruits inspected, and the number of men rejected in each group of occupations:—

United Kingdom.

Occupations of Recruits.	Number Inspected.	Rejected on Primary Inspection.	Rejected on Secondary Inspection.	Total Rejected.	Ratio per 1,000 Rejected.
1. Labourers, Husbandmen, and Servants	10,338	3,446	375	3,821	369·6
2. Manufacturing Artisans (as Clothworkers, Weavers, Lace Makers, &c.)	2,434	925	60	985	404·7
3. Mechanics employed in Occupations favourable to physical development (as Carpenters, Smiths, Masons, &c.)	3,141	1,189	105	1,294	412·0
4. Shopmen and Clerks	1,251	441	33	474	378·9
5. Professional Occupations, Students, &c.	214	50	3	53	247·6
6. Boys	371	32	1	33	88·9
Total	17,749	6,083	577	6,660	375·2

The results do not differ materially from those of the preceding year, except that there has been an increase in the rejections in the classes of manufacturing artizans, and of shopmen and clerks, and a decrease in the professional occupations, and the boys. The proportion rejected was highest among the mechanics employed in occupations favourable to physical development, and, omitting the 5th and 6th classes on account of the smallness of the numbers included in them, lowest among the labourers, husbandmen, and servants.

The proportion of recruits furnished by each group of occupations was as follows:—

1. Labourer's, Husbandmen, and Servants	582·5
2. Manufacturing Artizans (as Clothworkers, Weavers, Lace-makers, &c...	137·1
3. Mechanics employed in occupations favourable to physical development (as Carpenters, Smiths, Masons, &c.) ..	177·0
4. Shopmen and Clerks	70·5
5. Professional occupations, Students, &c.	12·0
6. Boys	20·9
Total	1000·0

This shows an increase to the extent of 10 per 1,000 in the proportion of labourers, &c., compared with the numbers in 1868, and a decrease in the mechanics employed in occupations favourable to physical development.

II.—ON THE HEALTH OF THE TROOPS SERVING IN THE MEDITERRANEAN.

Section I.—Sickness and Mortality.

I.—Gibraltar.

STATISTICAL REPORT.

Gibraltar. The only alteration in the composition of the garrison during the year, was the addition to it of the 1st Battery 15th Brigade Royal Artillery, which arrived from New South Wales on the 9th of January.

The average strength of the troops during the year was 4,633; the admissions into hospital were 2,900, and the deaths 28, of which 22 occurred in and 4 out of hospital, and 2 among the invalids at Netley. These numbers give 626 admissions, and 6·03 deaths per 1,000 of mean strength, both much lower than the ratios of the preceding year.

The admissions and deaths were distributed among the different Corps composing the garrison as follows:—

Corps.	Average Annual Strength.	Admitted into Hospital.	Died.				Ratio per 1,000.	
			In Hospital.	Out of Hospital.	Of Invalids.	Total.	Admitted.	Died.
Royal Artillery	756	685	4	..	1	5	906	6·46
Royal Engineers	258	288	4	1	..	5	1,116	19·38
1st Battalion 13th Regiment ..	690	336	1	..	..	1	487	1·45
28th Regiment	749	336	4	1	1	6	449	8·01
71st „	689	386	2	..	..	2	560	2·90
74th „	717	436	4	1	..	5	608	6·97
83rd „	732	418	2	1	..	3	571	4·10

The other death was that of a man of the Commissariat Staff Corps.

The admissions and deaths in the Royal Engineers were extremely high, and the admissions in the Royal Artillery were also much above the proportion in the Line Regiments.

The admissions and deaths by the different classes of diseases are shown in the following Table, framed from Abstract No. 10 in the Appendix.

Orders.	Diseases.	1869. Average Strength, 4,633. Admitted into Hospital.	Deaths. At Gibraltar.	Deaths. Of Invalids.	Deaths. Total.	Annual ratio per 1,000 of Strength. Admitted.	Annual ratio per 1,000 of Strength. Died.	1869. Infantry at Home. Annual ratio per 1,000 of Strength. Admitted.	Died.
	I. *General Diseases.*								
1	Febrile Group ..	224	5	..	5	48·3	1·08	45·1	·38
2	Constitutional „ ..	621	7	..	7	134·0	1·51	158·6	2·35
	II. *Local Diseases.* Diseases of the—								
1	Nervous System ..	42	2	..	2	9·1	·43	9·5	·38
2	Eye	120	..	..	..	25·9	..	16·9	..
3	Ear	12	..	..	..	2·6	..	3·3	..
4	Nose	2	..	..	..	·4	..	·2	..
5	Circulatory System ..	37	4	2	6	8·0	1·29	12·3	1·17
6	Absorbent „ ..	17	..	..	..	3·7	..	11·8	..
7	Ductless Glands ..	..	..	..	..	..	..	..	·03
8	Respiratory System ..	168	3	..	3	36·3	·65	69·0	1·11
9	Digestive „ ..	359	1	..	1	77·5	·21	75·1	·35
10	Urinary „ ..	402	1	..	1	86·8	·21	118·9	·23
11	Generative „ ..	64	..	..	..	13·8	..	11·0	..
12	Organs of Locomotion	26	..	..	..	5·6	..	4·1	·03
13	Cellular Tissue ..	51	..	..	..	11·0	..	17·5	..
14	Cutaneous System ..	327	..	..	..	70·6	..	89·0	..
	III. *Conditions, &c.* Debility	13	..	..	..	2·8	..	3·7	..
	IV. *Poisons* ..	86	..	..	..	18·5	..	2·6	·22
	V. *Injuries.*								
2	Accidental	326	3	..	3	70·4	·65	82·2	·67
3	Homicidal	..	..	..	..	..	..	·1	·09
4	Self-inflicted	..	..	..	..	..	..	·2	·35
5	Judicial	1	..	..	..	·2	..		·06
	VI. *Surgical Operations*	...	..	..	..	..	..	·2	..
	No appreciable Disease	2	..	..	..	·4	..	·3	..
	Total	2,900	26	2	28	625·9	6·03	732·1	7·36
	Average 10 Years 1859–68	..	..	..	..	789·2	8·98	830·	7·95

The admissions into hospital by the class of GENERAL DISEASES amounted to 182 per 1,000 of the strength, or about two-sevenths of all the admissions, 48 per 1,000 being by the group of febrile, and 134 by those which may be termed constitutional diseases. The admissions and deaths by the chief diseases comprised in the class were as follows :—

Gibraltar.

General Diseases.	Admitted.	Died.	Annual ratio per 1,000. 1869. Admitted.	1869. Died.	1859–68. Admitted.	1859–68. Died.
Febrile—						
Eruptive Fevers	1	..	·2	..	1·4	·08
Continued „	185	4	39·9	·86	76·8	1·74
Paroxysmal „	35	1	7·6	·22	4·9	·08
Malignant Cholera	..	..	..	..	3·9	2·12
Influenza	..	..	..	..	5·1	..
Erysipelas	3	..	·7	..	1·2	·05
Other diseases of this group	..	..	..	..	..	..
Constitutional—						
Rheumatism	142	..	30·6	..	36·5	·02
Syphilis	422	..	91·1	..	77·4	·02
Scrofula, Phthisis, &c.	47	7	10·1	1·51	8·7	1·22
Scurvy and Purpura	3	..	·7	..	·2	..
Anæmia	9	..	1·9	..	·5	..
Other diseases of this group	3	..	·7	..	..	..

In the febrile group of general diseases, *continued fevers* have given rise to the highest ratio of admissions and deaths, but the former have been a little above half, and the latter exactly half the average of the preceding ten years. Six cases and four deaths were returned as enteric fever; two of the fatal cases occurred in the Royal Artillery, and one in the Royal Engineers, two cases, of which one proved fatal, in the 83rd Regiment, and one case, which recovered, in the 1st Battalion 13th Regiment. In the constitutional group, *syphilis* furnished the largest proportion of cases, amounting to one-seventh of all the admissions into hospital, and 13 per 1,000 above the average of previous years. The 83rd Regiment had the highest proportion of cases.

The admissions and deaths by *scrofula and phthisis* were higher than the average of the preceding ten years; the proportion of the former, however, was lower, and of the latter identical with the results for 1868. There was a decrease in the amount of *rheumatism*.

Diseases of the Nervous System.—Two deaths by paralysis were recorded in this class, one in the Royal Engineers, and the other in the 1st Battalion 13th Regiment.

Diseases of the Eyes were the cause of 120 admissions, or 26 per 1,000 of the strength, being a considerable reduction upon the proportion admitted for ophthalmia in the preceding year, and still more on the average of the ten years. 95 of the cases were returned as inflammation of the eye, and 15 of the eyelids, 8 of the cornea, and 2 of the iris.

Diseases of the Circulatory System were the most fatal of the local diseases. They were the cause of 6 deaths, 4 from valve disease of heart, 1 from rupture of ventricle of heart, and 1 from aneurism of aorta. The ratio of admissions and deaths did not differ much from the preceding year.

Diseases of the Respiratory System gave rise to 168 admissions, chiefly from bronchitis. Three deaths occurred from pneumonia and pleurisy out of 32 admissions. Diseases of the Digestive System were the cause of a considerable amount of inefficiency, dyspepsia, tonsillitis, and diarrhœa, being the principal diseases. Only one death occurred in this class, the fatal disease being abdominal dropsy in a man who had also cirrhosis of the liver, and fatty degeneration of the kidneys. The admissions by dysentery and diarrhœa amounted to 61, or 13 per 1,000 of the strength, being only one-fourth of the average of the ten preceding years.

Diseases of the Urinary System furnished the highest ratio of admissions of the local diseases, but this is due to gonorrhœa and its consequences being

included in this class. These amounted to 393 admissions, while of the diseases of the kidneys and bladder only 9 cases were admitted, one of which terminated fatally.

Diseases of the Generative System.—In this class 61 cases of inflammation of the testicle, not the result of gonorrhœa, are included. This disease is a frequent sequel of fever at Gibraltar. The ratio of admissions by this class was lower than in 1868, and under the average of the last ten years.

Diseases of the Cutaneous System were a cause of considerable inefficiency, the admissions having amounted to 71 per 1,000 of the strength, or about one-ninth of the total cases. Ulcers and boils were the chief diseases.

Poisons.—The admissions by this class were high, but three-fourths of the cases appear to have been included through a misapprehension, and to have been not cases of alcoholic poisoning but such as were under the old nomenclature returned under the head of intemperance (*ebriositas*). The cases of delirium tremens were 21 in number, being in the ratio of 4·5 per 1,000 of the strength, and very slightly above the proportion in the preceding year.

Accidental Injuries.—The admissions by these corresponded very closely with the average of preceding years. Three deaths occurred by them. One from multiple injury in a man of the 71st Regiment, caused by falling over a cliff when drunk, one from fracture of the skull caused by falling a height of about 60 feet into a quarry, and one from drowning at Catalan Bay. No cases of self inflicted injuries occurred during the year.

There was one admission into hospital for corporal punishment in a man of the Royal Artillery, who received 25 lashes in the military prison, and was sent to hospital by the Medical Officer in charge of the prison.

SANITARY REPORT.

Deputy Inspector-General Rutherford, C.B., reports :—

Some of the Medical Officers in charge of regiments and detachments, refer in their Sanitary Reports to the overcrowded condition of many of the barracks, their position, casemated structure, deficiency of ventilation, defective drainage, and insufficient water supply ; but no disease of any importance is specially attributed to these causes. Intemperance, as usual, is cited as productive of some of the ailments. In accordance with the recommendations of "the Barrack and Hospital Improvement Commission," much has been done to remedy many of the above insanitary conditions, although the objectionable position of some of the buildings, especially those situated in the "Line Wall," will militate against the object in view. The new drainage works of the town and garrison, as far as their construction is concerned, may be said to be finished.

The extensive works for the introduction of fresh water from the newly discovered source at the "North Front" are in a forward state. From this source, it is hoped, that a supply equal to 10 gallons per day, per head, for the civil and military population will be furnished. From both these measures, the best results in a hygienic point of view are fully anticipated.

The following is a statement of the more important sanitary services performed in the garrison during the year, as furnished from the office of the Commanding Royal Engineer :—

Completion of latrines and outfalls at Wellington Front. Completion of water-closets, baths, lavatories, &c., at Naval Hospital ; of latrines and urinals at the Town Range Barracks, Brewery Barracks, Fuze House Barracks, the Moorish Castle, and at the Gunner's Barracks ; of the water-closets at Retrenchment, and Engineer Officers' mess ; of the drainage works at Catalan Bay, and ablution rooms at Grand Casemate Barracks ; improvement of the ventilation of latrines, South Barracks ; of the outlet drain at Buena Vista Gulley ; of the drainage at Barrackmasters' quarters, Sand Pits ; the ventilation of the married soldiers' quarters at Buena Vista and King's Bastion. At the Ragged Staff Guard, new latrines, urinals, and wash-house ; at the Staff Dispensary, Cannon Lane, ventilation of the Compounder's quarters ; at

Gibraltar. Rosia, a bathing stage constructed, &c. At the Moorish Castle, Officers' quarters 1, 2, 3, and at the Serjeant's mess, Royal Artillery, water-closets provided. At the Town Range, Pavilions 2 and 3, water-closets provided, and the conversion of existing privies into water-closets, and the laying on of water from the new mains to meet the requirements of the Sanitary Commissioners; in fact, connecting all War Departmental drainage in central district with the New Town drainage.

The troops generally wear serge tunics in summer, a great improvement, I consider, in a hygienic, and probably in an economical point of view. I think similar *material* should be employed for the summer tunics of the Royal Artillery, and the trowsers of the Royal Engineers, both of which are *white* drill, which I consider very objectionable.

Considerable impulse has been given to the providing separate accommodation for the married soldiers, more especially for those stationed in the south, including the South Barracks, Europa and Windmill Hill, and this much-needed boon will shortly be extended to the corps stationed in the central district, a site for quarters having lately been selected. As this kind of accommodation is expanded, the barrack rooms become proportionately relieved, and possibly, the necessity for a "female hospital" (an establishment not without its drawbacks), more or less obviated.

The garrison or "Naval Hospital," as regard its ward arrangements, may be said to be in as satisfactory a state as its original structure admits of. The wards are well ventilated, warmed when necessary, and lighted with gas. Each patient has had, on an average, upwards of 2,300 cubic feet of space, some wards being altogether vacant. No hospital epidemic of any kind has made its appearance, the sick recover readily, and wounds and injuries heal kindly. New baths, lavatories, and water-closets have been built in convenient situations, but owing to an insufficient water supply, shortly, it is hoped, to be remedied, have not come into general use.

II.—Malta.

Statistical Report.

Malta. No change took place during the year in the composition of the Force employed. The average strength of the troops, exclusive of the Royal Malta Fencibles, was 5,027 men, among whom there were 3,294 admissions into hospital, and 49 deaths—34 in hospital, 9 out of hospital, and 6 among the invalids sent to England. These numbers give the proportions of 655 admissions and 9·75 deaths per 1,000 of mean strength, both much lower than in 1868, and also considerably under the average of the last ten years.

The admissions into hospital and deaths in each of the Corps serving in the command, are shown in the following Table:—

Corps.	Average Annual Strength.	Admitted into Hospital.	Died.				Ratio per 1,000 of Strength.	
			In Hospital.	Out of Hospital.	Of Invalids.	Total.	Admitted.	Died.
Royal Artillery	715	412	4	1	1	6	576·2	8·39
Royal Engineers	170	103	..	1	..	1	605·9	5·88
1st Battalion 24th Regiment ..	623	403	4	1	..	5	646·9	8·02
31st Regiment	694	363	1	1	1	3	365·1	3·01
48th „	731	573	6	1	..	7	783·9	9·57
52nd „	729	751	3	..	..	3	1006·7	4·11
64th „	639	295	8	1	1	10	461·7	15·65
87th „	627	382	6	2	1	9	609·2	14·85

The other deaths were those of two men of the Army Hospital Corps, and of a man of the 1st Battalion 14th Regiment, who had been left behind labouring under paralysis when the regiment embarked for India. Two invalids of the 14th also died in England while awaiting their discharge. The admissions were considerably above the average in the 52nd, and the deaths in the 64th and 87th Regiments. *Malta.*

The following Table, framed from Abstract No. 10 in the Appendix, shows the admissions and deaths by each class of diseases.

Orders.	Diseases.	1869.—Strength, 5,027. Admitted into Hospital.	Deaths. In Malta.	Deaths. Of Invalids.	Deaths. Total.	Annual ratio per 1,000 of Strength. Admitted.	Annual ratio per 1,000 of Strength. Died.
1	I. *General Diseases.*						
2	Febrile Group	967	4	..	4	192·4	·79
	Constitutional „	258	3	2	5	51·3	1·00
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	46	5	..	5	9·1	1·00
2	Eye	131	..	..	..	26·0	..
3	Ear	10	..	..	..	2·0	..
4	Nose	1	..	..	..	·2	..
5	Circulatory System	51	6	1	7	10·1	1·39
6	Absorbent „	20	..	..	..	4·0	..
8	Respiratory „	169	3	3	6	33·6	1·19
9	Digestive „	490	6	..	6	97·5	1·19
10	Urinary „	128	..	..	..	25·5	..
11	Generative „	57	..	..	..	11·3	..
12	Organs of Locomotion	27	..	..	..	5·4	..
13	Cellular Tissue	130	..	..	..	25·9	..
14	Cutaneous System	308	..	..	..	61·3	..
	III. *Conditions, &c.*						
	Debility	22	..	..	..	4·4	..
	IV. *Poisons*	39	5	..	5	7·7	1·00
	V. *Injuries.*						
2	Accidental	422	5	..	5	83·9	1·00
4	Self-inflicted	6	5	..	5	1·2	1·00
	VI. *Surgical Operations* ..	2	1	..	1	·4	·19
	No appreciable disease	10	..	..	..	2·0	..
	Total	3,294	43	6	49	655·2	9·75
	Average of 10 Years, 1859–68..	..	..	..	..	882·1	14·35

General Diseases were the cause of upwards of a third of all the admissions; nearly three-fourths of them were of the febrile group. The following Table shows the prevalence and mortality of the principal diseases of this class:—

Malta.

General Diseases.	1869.		Annual Ratio per 1,000 of Strength			
			1869.		1859–68.	
	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Febrile—						
Eruptive Fevers	3	..	·6	..	1·3	·07
Continued „	904	3	179·8	·60	188·6	4·10
Paroxysmal „	49	1	9·7	·20	4·2	·02
Malignant Cholera	..	..	..	..	2·6	1·93
Influenza	..	..	..	..	2·2	..
Erysipelas	8	..	1·6	..	·9	·02
Other diseases of this group	3	..	·6	..	..	..
Constitutional—						
Rheumatism	163	..	32·4	..	49·0	·04
Syphilis	49	..	9·7	..	31·5	..
Scrofula, Phthisis, &c.	40	3	7·9	..	10·5	1·90
Scurvy and Purpura	2	..	·4	..	·7	·04
Anæmia	..	..	..	..	1·4	·04
Other diseases of this group	4	1	·8	·20	..	..

There was a slight decrease in the admissions by *continued fevers* and increase in those by *paroxysmal*, but the ratio of mortality by both was only one-fifth of the average of the ten preceding years. Compared with the results for 1868, the reduction in both admissions and deaths by *continued fevers* was very marked. The increase in paroxysmal fevers was entirely in the 48th Regiment, which furnished 42 out of the 49 cases. The Medical Officer gives no explanation of this circumstance. The only two corps which had an undue proportion of admissions by continued fevers were the 48th and 52nd; the excess in them occurred in the months June to September, during which period the former was quartered in the Isola, Gate, San Francisco di Paolo, and Polverista Gate Barracks, and the latter in Forts Ricasoli, San Salvator, and Zabbar Gate Barracks. The admissions by fevers of the continued type amounted in the 48th Regiment to 269, and in the 52nd to 449 per 1,000 of mean strength, but without any deaths. The ratio of admissions among the rest of the troops was only 106 per 1,000. Of the 904 cases admitted, 19 were returned as enteric fever, with one death; 734 as simple continued fever with two deaths, and 151 as febricula. The Principal Medical Officer attributes the immunity from fever compared with the preceding year, and the low rate of mortality by it, to the circumstances that all fatigues, drills, and working parties, except those absolutely necessary, were suspended during the hot season, and that the arrangement for relieving the barrack rooms by a proportion of the men sleeping under canvas was carried out more generally than in previous years. The excess of fevers in the 48th and 52nd Regiments was, in his opinion greatly due to it being the first summer these Corps had served in the command, and also to the 52nd being composed of extremely young men.

The *constitutional group* of general diseases gives very satisfactory results. Rheumatism and syphilis were both much lower than in 1868, and the admissions and deaths by phthisis and scrofula were much under the average.

Of Local Diseases those of the Eye furnished 26 admissions per 1,000, chiefly from ophthalmia, being a slight decrease on the results of the preceding year. Diseases of the Circulatory System were also less prevalent; one-third of the admissions were entered under the head of palpitation of the heart, not symptomatic of organic disease. The admissions by Diseases of the Respiratory System show a reduction, but the deaths correspond closely with the proportion in 1868. Diseases of the Digestive System furnished the largest proportion of cases in this class, the chief diseases being dyspepsia, diarrhœa, and tonsillitis. There were only 10 cases of dysentery reported, one of which however proved fatal in a young soldier of the 87th Regiment.

The admissions by DISEASES OF THE URINARY SYSTEM amounted to 25½ per 1,000, but of these 23 per 1,000 were cases of gonorrhœa and its consequences.

DISEASES OF THE CELLULAR TISSUE occasioned 26 admissions per 1,000, four-fifths of them being cases of abscess.

DISEASES OF THE CUTANEOUS SYSTEM furnished 61 admissions per 1,000 of mean strength: two-thirds of them being caused by boils and ulcers.

Under the head of POISONS 39 cases and five deaths are entered, all of delirium-tremens. The Royal Engineers furnished much the highest proportion, having had six cases in a strength of 170 men, while the 52nd and 48th Regiments had each only one and two cases respectively.

The accidental INJURIES differed little in amount from the average. The deaths, which were five in number, were caused, two by drowning, and three by fracture of the skull. The self-inflicted deaths were more numerous than usual; three were by cut throat, one by gunshot wound, and one by concussion of the brain, caused by the man throwing himself over a gallery in hospital while under treatment for delirium tremens.

SURGICAL OPERATIONS.—The only important operation was ligature of the left common carotid artery in a man of the 31st Regiment. The operation was performed to check hæmorrhage from the tongue, the result of a severe accidental injury. The man survived the operation six days, but ultimately died of hæmorrhage.

ROYAL MALTA FENCIBLE ARTILLERY.

The average strength of the Corps was 547: the admissions into hospital were 437, and the deaths three: being in the ratio of 799, and 5·49 per 1,000 of mean strength, the former slightly, and the latter very much lower than in the preceding year.

The following Table, framed from Abstract No. 10 in the Appendix, shows the influence of the different classes of diseases in causing this amount of sickness and mortality.

Malta.

Orders.	Diseases.	Royal Malta Fencible Artillery. Average Strength. 547. Admitted.	Died.	Annual Ratio per 1,000. 1869. Admitted.	Died.	Annual Ratio per 1,000 of Strength. Line Regiments at Malta. 1869. Admitted.	Died.
	I. *General Diseases.*						
1	Febrile Group	37	..	67·7	..	192·4	·79
2	Constitutional „	38	1	69·5	1·83	51·3	1·00
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	4	1	7·3	1·83	9·1	1·00
2	Eye	45	..	82·3	..	26·0	..
3	Ear	1	..	1·8	..	2·0	..
4	Nose	..	..	..	..	·2	..
5	Circulatory System	5	..	9·2	..	10·1	1·39
6	Absorbent „	..	..	..	..	4·0	..
8	Respiratory „	40	..	73·1	..	33·6	1·19
9	Digestive „	101	1	184·7	1·83	97·5	1·19
10	Urinary „	26	..	47·5	..	25·5	..
11	Generative „	1	..	1·8	..	11·3	..
12	Organs of Locomotion	4	..	7·3	..	5·4	..
13	Cellular Tissue	21	..	38·4	..	25·9	..
14	Cutaneous System	79	..	144·4	..	61·3	..
	III. *Conditions, &c.*						
	Debility	..	..	..	..	4·4	..
	IV. *Poisons*	..	..	..	..	7·7	1·00
	V. *Injuries.*						
2	Accidental	33	..	60·3	..	33·9	1·00
4	Self-inflicted	1	..	1·8	..	1·2	1·00
	VI. *Surgical Operations*	..	..	..	..	·4	·19
	No appreciable disease	1	..	1·8	..	2·0	..
	Total	437	3	798·9	5·49	655·2	9·75
	Average of 10 years 1859–68	..	..	821·3	8·72	882·1	14·35

The admissions and deaths were below the average of the preceding ten years: the former were above and the latter under the proportion among the troops of the line.

General Diseases.—The admissions by the febrile group of this class were much lower than among the troops of the line, the difference being chiefly in the prevalence of fevers; the great majority of the cases in the Malta Fencible Corps were returned under the head of febricula. The constitutional group furnished a higher proportion of cases than among the troops of the Line, the excess being in cases of acute rheumatism. Syphilis was rather more prevalent than in the line, but the difference was inconsiderable. No cases of phthisis were admitted during the year, and only one of scrofula.

LOCAL DISEASES.—Affections of the eye were thrice as prevalent as among the troops of the Line. Ophthalmia is stated to have prevailed in the Autumn, as usual, endemically among the civil population and in the regiment. It was a mild form of the disease.

Diseases of the respiratory and digestive systems furnished a high proportion of admissions, the former by bronchitis, the latter by tonsillitis, dyspepsia, and diarrhœa. Tonsillitis in a severe form prevailed endemically in the Autumn, and several cases of diphtheria among the children were reported at that season. The high ratio of admissions by diseases of the cutaneous system was due to ulcers and boils, the latter of which were unusually prevalent during the hot weather, but no specific cause could be assigned for the excess.

SANITARY REPORT.

Inspector-General Paynter, in his Sanitary Report for 1869, expresses his opinion that drinking to excess has been the most fertile cause of disease. He says—"I am so much impressed with the feeling of its being so very common a cause of disease, that I attribute the very great majority of admissions into hospital as being the result, either directly or indirectly, of intemperance."

The following are among the causes of disease referred to in the different Regimental Reports, viz., badly-constructed, insufficiently lighted, and ill-ventilated barrack-rooms. Dampness of rooms, in winter, without means of warming and drying them. Insufficient water for flushing purposes. Badly-constructed latrines and urinals, with very defective drainage and sewerage. Insufficient lavatory and bath accommodation. Insufficient means for cooking the rations in a satisfactory manner. The climate of Malta during the year has been a most healthy one. The selected sites on which barracks are built, and the insanitary condition of the vicinities of barracks are prejudicial to health. Guard-rooms, "lock-up" rooms, and cells, in several instances, are stated to be too small, with insufficient light and ventilation, and several of the Medical Officers state that the canteens attached to some of the barracks are very small, dark, damp, and insufficiently ventilated.

Such are some of the most prominent causes to which we may attribute attacks of disease; but where so many really exist it is difficult to select any one, or even two, as being the most evident.

The most important sanitary improvements which demand attention, are the securing an abundant supply of pure water for drinking and cooking purposes, as well as a plentiful supply for flushing latrines, urinals, and sewers, as also a sufficient quantity for the supply of the lavatories and baths. Each room should be supplied with filters sufficient for insuring filtered water for all its occupants. The barrack accommodation demands most serious consideration, for, with the exception of St. Francis Barrack-rooms at Floriana, St. James' Cavalier Rooms and Pembroke Camp Barrack-rooms, nearly all the Barrack-rooms in the Command are ill-constructed, dark, gloomy, damp, and ill-ventilated. Every barrack-room should have a fire place, with an allowance of fuel granted during the winter months, in order to keep it free from damp and assist in ventilating it. In some barracks, such as Fort Ricasoli, for instance, quarters for married soldiers are urgently required. The rooms in the "Verdala" Barrack, and those at "Polverista" Gate, have been over-crowded at times during the year. Wooden huts should not be used as dwellings; they are too hot in summer and too cold and damp in winter. Many of the guard-rooms, cells, and "lock-up" rooms require attention as regards size, light, and ventilation. Properly-constructed latrines and urinals, with continuous flushing pipes fixed to the latter, are required in many of the barracks, with sewers, &c., leading from them. Improvement in barrack kitchens is required in many of the barracks, as well as proper ablution and bath rooms. Each soldier should wear a flannel waistcoat and a pair of drawers next his skin all the year round. At present it is *optional* with the soldier whether he wears a flannel or a cotton shirt. This is a bad system.

Malta. The order should be *peremptory* for every soldier to wear the under-clothing above recommended. All fatigues, drills and working parties, not absolutely necessary, should cease from June 1st to October 31st of each year, or as long as the weather continues hot and oppressive; and half of the men of all regiments, excepting those occupying St. Francis Barrack, St. James's Cavalier, and Pembroke Camp, should sleep in tents during the same period. Such arrangements must, of course, always depend on peculiarity of seasons.

Several Medical Officers have stated that the places selected for bathing are, at times, prejudicial to health, as the water becomes impregnated with the sewerage which is carried into the sea by the town sewers.

Satisfactory hospital accommodation for the sick in this Command is a most prominent requirement. Nothing could be worse than the present buildings or the sites on which some of them are placed.

The year 1869 has been a healthy one, not only as regards the troops, but as regards the civil population of Malta. At the same time, I believe that the very satisfactory state of health which has obtained amidst the troops in the Command, has resulted, in a great measure, from the orders which were given by the Lieutenant-General Commanding; that all fatigues, drills, and working parties, save those absolutely necessary, should cease during the hot season; and, more especially, ordering that troops occupying certain barracks, should sleep under canvas during the same hot and oppressive time. I am not aware that the above alluded to sanitary arrangements were ever in former years carried out so generally.

The other leading and more prominent sanitary improvements which have been effected since the end of 1868, are the following:—

At *Upper Fort, St. Elmo.*—"Lock-up" room has had a ventilating shaft erected in it.

"Warren's" cooking apparatus supplied to kitchen.

Additional water supply.

At *St. James' Cavalier.*—Old latrines have been removed and new latrines and urinals erected in a better position.

A new lavatory and bath have been erected.

A new canteen has been erected.

At *St. Francis Barrack.*—A new oven has been erected in cook-house.

At *St. Francis Ravelin.*—The surface drainage has been much improved, and gas introduced into the rooms.

At *Marsamuscetto Barrack.*—A new canteen has been erected.

At *St. Peter's Lower Counter-guard Barrack* (*Fort Lascaris*).—A new latrine and urinal near the guard-room has been erected.

At *Floriana Barrack.*—A "Warren's" cooking apparatus has been erected in one of the cooking-houses.

At "*Notre Dame*" *Bastion.*—New latrines have been erected.

At "*Isola Gate*" *Barrack.*—No. 3 and 4 rooms are much improved by having a large window erected at end of each.

Gas has been introduced into this Barrack.

At *San Francisco di Paola Barrack.*—A new latrine and urinals have been erected.

A new lavatory and bath have been erected.

At *St. Elena Gate Barrack.*—A new cooking apparatus has been erected in cook-house.

At *Pembroke Camp.*—Better water supply and improved sewerage and drainage are in progress.

At the *Sanitarium Città Vecchia*—New latrines and urinals have been erected.

As regards the prevalence of venereal disease, there is a local ordinance in force for its prevention, viz., Ordinance No. 4 of 1861—"An Ordinance enacted "by the Governor of Malta, with the advice and consent of the Council of "Government thereof."

No special arrangements exist for nightly private ablution by the men.

The admissions, consequent on venereal affections, have been much less than in 1868.

Section II.

On the Extent of Invaliding among the Troops serving in the Mediterranean.

There were 256 men sent home as invalids from the Mediterranean Commands during the year, and 196 finally discharged the service at Netley, being respectively in the ratio of 26·5 and 20·2 per 1,000 of mean strength, and both above the average of the preceding ten years. *Mediterranean.*

The following Table, compiled from Abstract No. 10 in the Appendix, shows the classes of diseases which caused the invaliding of the men sent to England, and of those discharged the service.

	Invalids sent home from			Invalids discharged at Netley from		
	Gibraltar.	Malta.	Total.	Gibraltar.	Malta.	Total.
Continued Fevers	6	1	7	..	..	..
Paroxysmal Fevers	3	..	3	..	..	..
Rheumatism	15	5	20	11	2	13
Syphilis	9	4	13	4	4	8
Scrofula, Phthisis, and Hæmoptysis ..	33	20	53	32	28	60
Other general diseases	4	1	5	1	..	1
Diseases of the—						
Nervous System	15	11	26	1	6	7
Eye and Ear	11	2	13	9	5	14
Circulatory System	19	13	32	16	17	33
Respiratory „	9	6	15	1	1	2
Digestive „	13	9	22	12	10	22
Urinary „	4	4	8	1	3	4
Generative „	1	2	3	1	1	2
Organs of Locomotion	2	6	8	3	6	9
Cellular Tissue	2	1	3	..	1	1
Cutaneous System	6	4	10	2	..	2
Debility	4	6	10	11	3	14
Accidental injuries	3	1	4	..	2	2
Surgical operations	..	1	1	..	2	2
Total	159	97	256	105	91	196
Ratio per 1,000 of Mean Strength { 1869	34·3	19·2	26·5	22·6	18·1	20·2
Ratio per 1,000 of Mean Strength { 1860–68	25·8	19·9	22·7	19·0	14·3	16·6

The proportion of invalids sent home from Gibraltar was above the average, and also the proportion finally discharged the service of the invalids from both Gibraltar and Malta. Scrofula and consumption furnished the highest number of cases of all the groups of disabilities, and next to them, diseases of the circulatory system, valve disease of the heart being the most prominent of the latter among the Gibraltar, and palpitation among the Malta invalids. Eleven cases of ophthalmia were sent home from Gibraltar, being more than double the amount in the preceding year; six of them were from the 1st Battalion 13th Regiment. There were no invalids sent from Malta on account of ophthalmia.

Section III.

Mean Daily Sick.

Mediterranean. The average number constantly in hospital during the year was 142 at Gibraltar, and 179 at Malta, being respectively in the ratio of 30·65 and 35·61 per 1,000 of mean strength.

		Gibraltar.	Malta, exclusive of Royal Malta Fencibles.	United Kingdom. Infantry Regiments. Average of nine years, 1860–68.
Average Strength in 1869 ..		4,633	5,027	
Average constantly sick		142	179	
Ratio per 1,000 constantly sick	1869 ..	30·65	35·61	42·18
	1859–68..	39·86	46·15	
		days	days	days
Average sick time to each Soldier	1869 ..	11·19	13·00	15·39
	1859–68..	14·55	16·85	
Average duration of the cases	1869 ..	17·87	19·83	18·83
	1859–68..	18·44	19·10	

Compared with the results of the preceding year, there has been a marked reduction in the mean sick, and in the average sick time to each soldier, but a slight increase in the duration of the cases, more marked at Malta than Gibraltar, and at the former amounting to rather more than eight-tenths of a day.

Section IV.

On the Influence of Age on the Mortality.

The numbers serving, and the deaths at each age in quinquennial periods, in each of the Corps stationed throughout the year in the Mediterranean, are stated in Abstract No. 11 in the Appendix, from which the following Table has been framed.

		Ratio of deaths per 1,000 of strength at each period of life.					
		Under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and upwards.
Mediterranean Commands..	1869 ..	..	4·27	7·94	13·04	20·08	40·82
	1859–68	6·35	7·09	12·67	14·42	25·77	28·43

The reduction in the mortality which has been shown in the preceding pages was not confined to any period of life, but it was much less marked at the ages 30 and under 35, the period at which, as repeatedly pointed out in former Reports, the effect of the Limited Enlistment Act in reducing the mortality is usually manifest. The numbers serving above 40 are so small that no importance can be attached to the apparent increase in the mortality at that period of life.

III.—ON THE HEALTH OF THE TROOPS SERVING IN THE DOMINION OF CANADA.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

Dominion of Canada.

CONSIDERABLE changes took place in the composition of the Force employed in the Dominion of Canada during the year. In May, 3 Batteries 4th Brigade R.A., and the 1st Battalion 22nd Regiment; in June, the 4th Battalion 60th; in July, the 13th Hussars and a Battery 4th Brigade R.A., returned to England; in October the 53rd Regiment embarked for Barbadoes; in November, 3 Batteries 1st Brigade R.A. for Jamaica, Barbadoes, and Bermuda; and in December, the 29th Regiment for Jamaica, and a Company of Royal Engineers for Bermuda.

The average strength of the troops serving in the Dominion of Canada, including Canada, Nova Scotia and New Brunswick, and Newfoundland, was 9,151. The admissions into hospital were 5,376, and the deaths 80, including 6 among the invalids sent to England. The former, therefore, were in the ratio of 587, and the latter of 8·74 per 1,000 of mean strength, both somewhat under the average of the preceding ten years.

The distribution of the sickness and mortality among the different corps was as follows:—

	Average Annual Strength.	Admitted into Hospital.	Deaths.				Annual ratio per 1,000.	
			In Hospital.	Out of Hospital.	Of Invalids.	Total.	Admitted.	Died.
13th Hussars ..	283	200	1	2	..	3	706·7	10·60
Royal Artillery ..	1,683	1,153	18	4	2	24	685·1	14·26
Royal Engineers ..	287	123	1	..	1	2	428·6	8·97
1st Bn. 16th Foot ..	671	307	1	1	..	2	457·5	2·98
1st „ 22nd „ ..	303	76	1	1	..	2	250·8	6·60
29th Foot	621	428	1	1	..	2	689·2	3·22
30th „	276	126	1	..	..	1	456·5	3·62
53rd „	589	369	4	..	2	6	626·5	10·19
1st Bn. 60th Regt. ..	681	408	3	1	..	4	599·1	5·87
4th „ „ „ ..	350	173	4	..	..	4	494·3	11·43
69th Foot	728	533	2	..	..	2	732·1	2·75
78th „	735	514	5	1	..	6	699·3	8·16
1st Bn. Rifle Brigade	688	353	2	..	..	2	513·1	2·91
Royal Canadian Rifles	1,116	584	9	7	1	17	523·3	15·23

The other deaths were those of a Serjeant of the Commissariat Staff Corps and of two privates of the Army Hospital Corps.

Dominion of Canada.

The diseases by which the admissions and deaths were caused are detailed in Abstract No. 12 in the Appendix, from which the following classified summary has been framed:—

Orders.	Diseases.	Strength, 9,151. Admissions.	Deaths. In Dominion of Canada.	Deaths. Of Invalids.	Deaths. Total.	1869. Annual Ratio per 1,000. Admissions.	Deaths.
	I. *General Diseases.*						
1	Febrile Group	375	6	..	6	41·0	·65
2	Constitutional „	1,052	7	5	12	115·0	1·31
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	81	9	..	9	8·9	·98
2	Eye	118	..	..	..	12·9	..
3	Ear	26	..	..	..	2·8	..
4	*Nose*	4	..	..	..	·4	..
5	Circulatory system	59	16	..	16	6·4	1·75
6	Absorbent „	128	..	..	..	14·0	..
7	Ductless Glands	1	..	..	..	·1	..
8	Respiratory system	663	14	..	14	72·5	1·53
9	Digestive „	562	3	..	3	61·4	·33
10	Urinary „	771	5	..	5	84·3	·55
11	Generative „	104	..	..	..	11·4	..
12	Organs of Locomotion	34	..	1	1	3·7	·11
13	Cellular Tissue	196	1	..	1	21·4	·11
14	Cutaneous system	424	..	..	..	46·3	..
	III. *Conditions, &c.*						
	Debility	23	..	..	..	2·5	..
	IV. *Poisons*	83	2	..	2	9·1	·22
	V. *Injuries.*						
2	Accidental	660	6	..	6	72·1	·65
3	Homicidal	..	1	..	1	..	·11
4	Self-inflicted	2	4	..	4	·2	·44
	VI. *Surgical Operations* ..	4	..	..	..	·4	..
	No appreciable disease	6	..	..	..	·7	..
	Total	5,376	74	6	80	587·5	8·74
	Average of 10 years, 1859–68 ..	..	..	..	..	646·8	9·36

General Diseases were the cause of less than one-fourth of the admissions and deaths; about one-fourth of the cases were of the febrile, and three-fourths of the constitutional group.

The prevalence of the principal diseases of the class is shown in the following Table:—

Diseases.	Admitted.	Died.	Ratio per 1,000 of Strength. 1869. Admitted.	1869. Died.	1859-68. Admitted.	1859-68. Died.
Febrile—						
Eruptive Fevers	27	1	2·9	·11	3·3	·03
Continued „	178	4	19·5	·44	15·7	·60
Paroxysmal „	62	..	6·8	..	5·1	·05
Influenza	54	..	5·9	..	6·7	..
Erysipelas	51	..	5·6	..	3·6	·09
Other *Diseases* of this group	3	1	·3	·11	..	·09
Constitutional—						
Rheumatism	320	..	35·0	..	30·2	·06
Syphilis	663	..	72·4	..	79·1	·01
Scrofula, Phthisis, &c.	51	10	5·6	1·09	·9·2	1·65
Scurvy and Purpura	5	..	·6	..	1·9	..
Anæmia	6	..	·7	..	·2	..
Other Diseases of this group	7	1	·8	·11	..	..

Eruptive Fevers were not above the average of the preceding ten years, and were much less prevalent than in 1868. Eight cases of smallpox were admitted, 7 at Montreal and 1 at St. John's, Canada; 2 women and 8 children of the Canadian Rifles, at St. John's, were also affected. There were 13 cases and a death of scarlet fever; of these 10, including the fatal case, occurred in the 4th Battalion 60th Regiment, at St. John's, New Brunswick, where the disease prevailed as an epidemic among the civil population in a very severe form. Sixteen cases and four deaths were reported among the children of the Regiment.

Paroxysmal Fevers were above the average, but this was entirely due to the prevalence of ague in the Detachment of the 29th Regiment stationed at London, C.W. Of 59 cases of ague which occurred throughout the Command, 44 were in this Regiment, and most of them in the Detachment at London.

Erysipelas was also above the average; the corps which furnished the greatest number of cases were the 53rd at Quebec, the 1st Battalion 60th at Montreal, the 29th at Toronto, and the 78th at Montreal. None of the cases terminated fatally.

The other diseases of this class differed so little from the average as not to require special comment.

Local Diseases.—Those of the *urinary system* furnished the highest ratio of admissions, but gonorrhœa constituted upward of three-fourths of the cases, having amounted to 614, or 66·6 per 1,000 of mean strength.

Next in point of frequency were diseases of the *respiratory system*, chiefly bronchitis and pneumonia. Of the former there were 499 cases and 3 deaths, and of the latter 120 cases and 9 deaths.

Poisons.—There were 81 cases and 2 deaths of *delirium tremens* reported, the former being considerably above, and the latter much under, the proportion in 1868.

Accidental and Violent Deaths were much under the average of the preceding ten years. Of the accidental deaths, 5 were by drowning and 1 by asphyxia from accidental strangling. There was 1 homicidal death from fracture of the skull, and 4 suicidal deaths—one by cut-throat, one by firearms, and two by poison, opium being the agent employed in one case and cyanide of potassium in the other.

SANITARY REPORT.

Dominion of Canada.

Inspector-General McIllree reports :—

The various Sanitary Reports from regiments serving in the Dominion during the war coincide in describing the health of the respective corps as having been satisfactory. Although sanitary defects, chiefly due to original faulty construction, have existed in many of the barracks, no appreciable injury has accrued to the health of the troops, and all remediable defects have been at once rectified on representation.

The amount of cubic space has in some instances been somewhat limited, as in Artillery Park, and South Barracks, Halifax, where it was only about 450 cubic feet per man for some time.

On closing the Consolidated Hospital (hired buildings) in Craig Street, some difficulty was experienced in relation to the hospital accommodation for the 1st Battalion Rifle Brigade at Montreal.

The old Ordnance, or Water Street Hospital, in addition to being badly situated, was manifestly ill-adapted for the sick of a battalion of Infantry and a battery of Field Artillery ; but as no other public building was available, and there was every prospect of a further reduction of the Montreal garrison, the advisability of obtaining increased accommodation for the sick was not pressed, and no ill results followed.

The rations and water supply have been good. I am still of the opinion stated in my Report for 1867, that in this country "an additional quarter of "a pound of meat would materially add to the health and physical efficiency of "the troops."

The winter clothing is admirably suited to Canada, but the ordinary summer clothing (English) cannot be so favourably noticed. For this climate a loose serge jacket and trousers, and a more efficient protection to the head than the ordinary forage cap, would be very desirable.

The new system of checking intemperance by fines has not been sufficiently long in operation to pronounce decisively as to its efficacy, but Medical Officers, and those who have written on the subject, advocate it.

As an additional incentive to temperance, the utilizing of soldiers in other employments than those immediately appertaining to their profession would seem reasonable.

There have been frequent efforts made to extend the influence of the "Contagious Diseases Act" (in partial operation in England) to Canada, but hitherto without result. There are no special arrangements or facilities for nightly private ablution by the men. The amount of venereal diseases during the year under consideration, has neither been augmented nor lessened materially. As might be anticipated, Quebec and Halifax (seaport towns) give the greater proportion of cases.

Section II.

On the Extent of Invaliding.

During the year 169 invalids were sent to England, 13 were discharged in the Colony, and 115 at Netley. These numbers give the proportion of 18·34 sent home, and 13·89 finally discharged per 1,000 of mean strength.

The following Table, framed from Abstract No. in 12 the Appendix, shows the classes of diseases which gave rise to the invaliding :—

Dominion of Canada.

Disabilities.	Invalids sent home.	Invalids Discharged the Service.	
		In Canada.	At Netley.
Rheumatism	4	..	2
Syphilis	17	1	7
Scrofula and Phthisis	29	..	34
Other Constitutional Diseases	2	1	2
Diseases of the—			
Nervous System	22	3	9
Eye and Ear	9	1	7
Circulatory System	16	4	12
Respiratory „	21	..	2
Digestive „	12	..	13
Urinary „	8	..	6
Generative „	..	..	1
Organs of Locomotion	2	..	5
Cellular Tissue..	4	..	1
Cutaneous System	3	..	2
Debility	15	2	4
Accidental Injuries	4	1	6
Surgical Operations	1	..	2
Total	169	13	115
Ratio per 1,000 of Mean Strength .. .. { 1869 ..	18·34	1·41	12·48
{ 1860–8..	15·83	2·27	14·43

The proportion of invalids sent home has been slightly above, and that of men finally discharged the Service both abroad and at Netley slightly below, the average of the preceding nine years. Scrofula and phthisis have been the most important disabilities, and next to them diseases of the nervous system. Syphilis and diseases of the circulatory system have also contributed largely to the invaliding.

Section III.

Mean Daily Sick.

The average number of soldiers constantly non-effective from sickness during the year was 273, being in the ratio of 29·83 per 1,000 of mean strength. The following Table gives the usual deductions on this subject:—

	1869.	1859–68
Ratio per 1,000 constantly Sick	29·83	30·22
	days.	days.
Average Sick time to each Soldier	10·89	11·03
Average duration of the cases of Disease	18·54	17·05

The mean daily sick and average sick time to each soldier were very slightly below the average of the preceding ten years, but the duration of the cases was a day and a-half above the average.

Section IV.

Influence of Age on the Mortality.

Dominion of Canada.

The ages of the men serving in the Dominion of Canada throughout the year, and the deaths at each age, are shown in the following Table, framed from Abstract No. 13 in the Appendix :—

		Under 20	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and upwards.
Ratio of Deaths per 1,000 of mean strength	1869 ..	..	4·69	6·17	9·57	15·45	21·39
	1859–68	4·04	6·02	10·03	11·38	17·55	18·35

This Table shows a progressive increase in the rate of mortality with the advance of age. There is a break in the regularity of the increase at the ages 30 and under 35 on the average of the ten years, but it is scarcely perceptible in the results for 1869. This difference may probably be a consequence of the small number of cases under obervation for one year.

IV. ON THE HEALTH OF THE TROOPS SERVING IN BERMUDA.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

Bermuda.

Two Companies of Royal Engineers embarked for Nova Scotia in May, and were replaced by a Company from England in October, and one from Canada in November. In addition to these the garrison was composed of three Batteries Royal Artillery, three Companies Royal Engineers, the 1st Battalion 15th Regiment, and the 61st Regiment.

The average strength of the troops during the year was 1,986, the admissions into hospital were 1,775 and the deaths 38, of which 29 occurred in hospital, nine out of it, and one among the invalids at Netley. These numbers give the ratio of 894 admissions and 19·13 deaths per 1,000 of mean strength, the former considerably higher, and the latter nearly one-fourth lower, than in the preceding year.

The following Table shows the amount of sickness and mortality in each corps:—

	Average Annual Strength.	Admitted into Hospital.	Died.				Ratio per 1,000 of Strength.	
			In Hospital.	Out of Hospital.	Of Invalids.	Total.	Admitted.	Died.
Royal Artillery.. ..	200	133	1	1	..	2	665	10·00
,, Engineers ..	336	339	7	2	..	9	1,009	26·78
1st Bn. 15th Regiment	710	735	14	4	..	18	1,035	22·35
61st Regiment	709	565	6	2	1	9	797	12·69

The sickness and mortality in the Royal Engineers and 15th Regiment were greatly in excess of the amount in the other two corps.

The diseases by which the admissions and deaths were caused are detailed in Abstract No. 12 in the Appendix, from which the following Table has been prepared:—

Bermuda.

Orders.	Diseases.	1869. Average Strength, 1,986. Admitted into Hospital.	Deaths. At Bermuda.	Deaths. Of Invalids.	Deaths. Total.	Annual ratio per 1,000 of Strength. Admitted.	Annual ratio per 1,000 of Strength. Died.
	I. *General Diseases.*						
1	Febrile Group.. ..	289	13	..	13	145·5	6·55
2	Constitutional „	155	2	1	3	78·0	1·51
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous system	25	4	..	4	12·6	2·01
2	Eye	82	..	..	..	41·3	..
3	Ear	14	..	..	..	7·1	..
4	Nose	1	..	..	..	·5	..
5	Circulatory system ..	22	3	..	3	11·1	1·51
6	Absorbent „ ..	9	..	..	..	4·5	..
8	Respiratory „ ..	96	..	..	..	48·3	..
9	Digestive „ ..	381	5	..	5	191·8	2·52
10	Urinary „ ..	59	2	..	2	29·7	1·01
11	Generative „ ..	27	..	..	..	13·6	..
12	Organs of Locomotion ..	2	..	..	..	1·0	..
13	Cellular Tissue	40	1	..	1	20·1	·50
14	Cutaneous system.. ..	219	..	..	..	110·3	..
	III. *Conditions, &c.*						
	Debility	19	..	..	..	9·6	..
	IV. *Poisons* ..	70	1	..	1	35·3	·50
	V. *Injuries.*						
2	Accidental	264	1	..	1	132·9	·50
4	Self-inflicted..	1	5	..	5	·5	2·52
	Total	1,775	37	1	38	893·7	19·13
	Average of 10 years 1859–68	..	..	..	..	724·4	30·15

The admissions into hospital have been much above, but the deaths one-third under, the average of the preceding ten years.

General Diseases gave rise to one-fourth of the admissions andone-third of the deaths: when sub-divided they give the following results:—

Diseases.	Admitted.	Died.	Ratio per 1,000 of Mean Strength. 1869. Admitted.	1869. Died.	1859-68. Admitted.	1859-68. Died.
Febrile—						
Eruptive Fevers	..	..	..	..	·1	..
Continued „	237	13	119·3	6·55	71·3	2·95
Yellow Fever	..	..	..	..	42·1	15·03
Paroxysmal Fevers	6	..	3·0	..	2·5	·09
Influenza	44	..	22·2	..	9·2	·09
Erysipelas	1	..	·5	..	1·5	..
Other Diseases of this group	1	..	·5	..	..	..
Constitutional—						
Rheumatism	102	..	51·4	..	25·4	..
Syphilis	35	..	17·6	..	27·5	..
Scrofula, Phthisis, &c.	15	2	7·5	1·00	12·3	2·28
Scurvy and Purpura	..	..	..	..	·5	..
Anæmia	..	..	..	..	1·3	..
Other Diseases of this group	3	1	1·5	·50	..	..

Continued fevers have been the most prevalent and fatal of the general diseases. The admissions were one-half above, and the deaths were double the average of the preceding ten years. Compared with the results for 1868, there has been a slight increase in the cases, but a decrease to the extent of one-third in the deaths. As in that year the Royal Artillery enjoyed a marked exemption, while the 1st Battalion 15th Regiment suffered most severely. The prevalence of the different types of continued fever in each of the Corps is shown in the following Table:—

	Average Annual Strength.	Enteric Fever. Admitted.	Enteric Fever. Died.	Simple continued Fever. Admitted.	Simple continued Fever. Died.	Febricula. Admitted.	Febricula. Died.
Royal Artillery	200	..	..	2	..	8	..
Royal Engineers	336	6	2	7	..	40	..
1st Battalion 15th Regiment	710	43	9	8	..	86	..
61st Regiment	709	3	..	21	2	13	..

The great excess of admissions in the 15th Regiment was caused by febricula and enteric fever, and of deaths by the latter type. Febricula was above the average in the Royal Engineers, and simple continued fever in the 61st. The great prevalence of fever in the 15th Regiment occurred in the last quarter of the year, when there was scarcely any in the other corps. The 15th had 24 cases and five deaths in October, nine and three in November, and 10 with one death in December, of enteric and simple continued fever, while the rest of the troops in the same period had only five admissions, and no deaths under these heads. The disease was almost confined to the men stationed at St. George's and Knapton. The Surgeon of the regiment states that he "found it impossible to lay his finger on any specific cause for the

Bermuda. "prevalence of this fever." Some cases of yellow fever were sent to hospital at Ports Island from Her Majesty's ship "Barracouta," and about four weeks after they had re-embarked four cases occurred among a party of Marines sent there from Ireland Island to repair and whitewash the hospital. The disease did not extend to the troops.

Influenza was more prevalent than in former years, but was confined to the Royal Engineers and 61st Regiment; the former had 13 and the latter 31 cases.

Rheumatism was the most prevalent of the constitutional group of general diseases, and the admissions by it were considerably above the average of the preceding ten years. The Royal Engineers and 61st Regiment furnished the highest proportion of cases.

The admissions by *syphilis* corresponded closely with the proportion in the preceding year, but they were little more than half the average of the last ten years.

Scrofula and *Phthisis* amounted to only half the average, but did not differ greatly from the proportion in 1868.

Diseases of the Nervous System were under the average of previous years.

Diseases of the Eye were the cause of considerable inefficiency, chiefly from the prevalence of ophthalmia in the 15th Regiment. As noticed in last Report, this corps has for some years had a high proportion of cases, and the results of the year under review show an increase. The prevalence of ophthalmia in it is attributed by the Medical Officer in charge to climatic causes.

Diseases of the Circulatory System were more prevalent though less fatal than in preceding years. The excess of cases was caused by the admission of 13 under the head of palpitation, seven of which occurred in the 15th Regiment, and may probably have been the result of intemperance.

Diseases of the Digestive System were the most prevalent of the local diseases, the principal affections being diarrhœa, dysentery, and dyspepsia. The two former were considerably under the proportion which occurred in 1868, but greatly in excess of the average of the last ten years. As in 1868, dysentery was almost confined to the 15th Regiment, but the other corps had a higher proportion of cases of diarrhœa. The Royal Engineers and 61st Regiment had the greatest amount of dyspepsia.

Diseases of the Urinary System.—The admissions by these diseases amounted to 3 per cent. of the force, but four-fifths of them were by gonorrhœa. The fatal cases were one of Bright's disease and one of urinary abscess.

Diseases of the Cutaneous System differed little from the average of previous years. Boils and ulcers constituted three-fourths of the cases.

Poisons.—Under this class 70 admissions and one death by *delirium tremens* appear. The Royal Engineers and 15th Regiment furnished much the largest proportion of the cases; the death occurred in the latter corps.

Accidental Injuries were greatly in excess of previous periods, but with a very low ratio of deaths. The admissions were chiefly from bruises, wounds, and sprains. The Royal Artillery furnished the highest proportion of cases.

Self-inflicted Injuries.—The proportion of suicidal deaths was three times the average of the ten preceding years. Two of them were in the Royal Engineers, two in the 15th, and one in the 61st Regiment. Four were caused by gunshot wounds, and one by drowning.

SANITARY REPORT.

Deputy Inspector-General Bowen reports that—

The health of the troops did not appear to have been affected by any insanitary state of barracks or camps.

In his opinion much of the sickness at this station is caused indirectly by the too free use of alcoholic drinks, and he does not think the sale of spirits at canteens desirable. "I believe," he says, "it encourages spirit

'drinking. I am convinced that the 'craving' for spirits spoken of here 'is merely a bad habit, which could be equally contracted anywhere else 'if the same facilities existed, though its effects would not perhaps be "everywhere so injurious." *Bermuda.*

During the past year the following sanitary services have been completed:—

At St. George's:—ablution rooms, used by the Royal Engineers, have been provided with basins and baths of Jennings' pattern.

The married soldiers' quarters:—cook-house built and fitted with ranges, ovens, and boilers, approved patterns.

Royal Hospital:—water laid on to kitchen. Additional hospital accommodation provided for 40 patients by the erection of a new wing.

Improved system of drainage introduced:—Jennings' waterclosets provided, and water laid on for flushing drains and other purposes.

Boaz Island:—the ablution rooms constructed with baths and urinals, and water laid on.

These improvements, with others in progress and contemplation, will shortly render the barracks here very complete in these necessary points.

During the summer, red serge patrol jackets were issued to the men of the Line and Royal Engineers. These are not considered suitable for summer wear—they become immediately saturated with perspiration, and cannot be properly washed. "They are very comfortable in cool weather in spring and "autumn, and also in most days in winter, but are quite unfitted for the "summer. It is absolutely necessary for maintaining health that the soldiers' "dress should be washed at least twice a week here in summer, and I consider "linen or cotton by far the best materials, and white the best colour, but if "woollen is decided on, it should be of some colour and texture that could be "readily washed, and a sufficient supply for that purpose should be issued."

There is no Local Act in these islands relative to the prevention of venereal diseases. No special arrangements exist for affording facility for nightly private ablution by the men.

The amount of venereal disease amongst the population in these islands is extremely small, and very few soldiers are admitted for disease of this description.

Section II.

On the Extent of Invaliding.

During the year 44 invalids were sent to England from Bermuda, and 33 were finally discharged the service at Netley, being in the ratio of 22·1 and 16·6 per 1,000 of mean strength, and very slightly in excess of the average of the preceding nine years. Half of the invalids sent to England were from the 15th Regiment.

The following summary of Abstract No. 12 in the Appendix shows the classes of diseases by which the invaliding was caused—:

Bermuda.

Disabilities.	Invalids sent Home.	Discharged the Service at Netley.
Rheumatism	2	2
Scrofula and Phthisis	3	5
Diseases of the—		
Nervous System	5	2
Eye	8	5
Ear	2	1
Circulatory system	7	6
Digestive „	7	4
Generative „	1	1
Organs of Locomotion	..	4
Cellular Tissue	2	..
Debility	3	2
Accidental Injuries	4	1
Total	44	33
Ratio per 1,000 of strength { 1869..	22·1	16·6
{ 1860–8	20·7	13·0

Diseases of the eyes were the most frequent cause of invaliding; all the cases were men of the 15th Regiment. Diseases of the circulatory system furnished the largest number of discharges from the Service, scrofula and consumption and diseases of the eye ranking next in point of frequency.

Section III.

Mean Daily Sick.

The average number of men constantly non-effective from sickness during the year was 77, being in the ratio of 38·8 per 1,000 of mean strength, or rather higher than in 1868, but differing very little from the average of the last ten years. The following Table gives the usual information deduced from these numbers:—

	1869.	1859–68.
Ratio per 1,000 of strength constantly sick ..	38·77	39·36
	days.	days.
Average sick time to each soldier	14·15	14·37
Average duration of the cases of disease ..	15·83	19·83

The proportion constantly sick and the sick time to each soldier correspond closely with, but the duration of the cases has been four days less than, the average of the last ten years; the excess of the previous period, however, occurred chiefly in years when epidemics of fever prevailed, and was probably due to the protracted convalescence of the cases.

Section IV.

On the Influence of Age on the Mortality.

Bermuda.

The following Table shows the rate of mortality at different ages, in quinquennial periods of life, among the troops serving in Bermuda. The details for 1869 are stated in Abstract No. 14 in the Appendix.

		Ratio of Deaths per 1,000 of Strength at each period of Life.					
		Under 20 Years.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and Upwards.
Bermuda ..	1869	5·43	16·79	15·21	22·02	35·71	..
	1859–68	14·16	12·48	23·45	28·11	47·87	14·92

The numbers under observation for one year are too small to justify any positive deductions. The average of the preceding ten years shows a break in the progressive increase of mortality at the age 30 and under 35, the period of life at which the operation of the ten years enlistment would be likely to affect the results.

V.—ON THE HEALTH OF THE TROOPS SERVING IN THE WEST INDIES.

Section I.

Sickness and Mortality.

I. Windward and Leeward Command.

STATISTICAL REPORT.

1. White Troops.

Windward and Leeward Command.

In the middle of January the 47th Regiment from Nova Scotia relieved the 2nd Battalion 16th Regiment, which proceeded to England; and in the end of November it was relieved by the 53rd Regiment from Nova Scotia, and embarked for England on the 4th December, accompanied by the 8th Battery 5th Brigade Royal Artillery, which was replaced by the 5th Battery of the same Brigade from Canada.

The average strength of the white troops in this Command during the year was 884.

The admissions into hospital were 946, and the deaths 5, including one of an invalid at Netley. These numbers give the proportion of 1,070 admissions, and 5·65 deaths per 1,000 of mean strength, both lower than in the preceding year and than the average of the last ten years.

The following Table, framed from Abstract No. 15 in the Appendix, shows the influence of the different classes of diseases in causing the sickness and mortality:—

Windward and Leeward Command.

Orders.	Diseases.	1869. Strength, 884. Admitted.	Died. In the Command.	Died. Of Invalids.	Died. Total.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.
	I. *General Diseases.*						
1	Febrile Group	273	1	..	1	308·8	1·13
2	Constitutional „	136	1	1	2	153·9	2·26
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	12	1	..	1	13·6	1·13
2	Eye	27	..	..	..	30·6	..
3	Ear	19	..	..	..	21·5	..
4	Nose	2	..	..	..	2·3	..
5	Circulatory System	5	..	..	..	5·7	..
6	Absorbent „	17	..	..	..	19·2	..
8	Respiratory „	26	..	..	..	29·4	..
9	Digestive „	79	1	..	1	89·2	1·13
10	Urinary „	111	..	..	..	125·6	..
11	Generative „	6	..	..	..	6·8	..
12	Organs of Locomotion	2	..	..	..	2·3	..
13	Cellular Tissue	17	..	..	..	19·2	..
14	Cutaneous System	83	..	..	..	93·9	..
	IV. *Poisons*	23	..	..	..	26·0	..
	V. *Injuries.*						
2	Accidental	105	..	..	..	118·8	..
4	Self-inflicted	1	..	..	..	1·1	..
	VI. *Surgical Operations*	1	..	..	..	1·1	..
	No appreciable disease	1	..	..	..	1·1	..
	Total	946	4	1	5	1070·1	5·65
	Average of 10 years 1859–68 ..	..	..	..	..	1188·6	13·35

General Diseases were the cause of upwards of two-fifths of the admissions and of three-fifths of the deaths. Two-thirds of the cases were of the febrile group, and two-thirds of the deaths by the constitutional. The following Table shows the influence of the principal diseases in each group upon the sickness and mortality :—

Windward and Leeward Command.

General Diseases.	Admitted.	Died.	Ratio per 1,000 of Mean Strength. 1869. Admitted.	1869. Died.	1859-68. Admitted.	1859-68. Died.
Febrile—						
Eruptive Fevers	..	..	..	..	3·5	..
Continued- „	128	..	144·8	..	50·8	·56
Yellow Fever	18	1	20·4	1·13	7·7	3·15
Paroxysmal Fevers	124	..	140·3	..	257·4	1·85
Influenza	2	..	2·3	..	4·6	..
Erysipelas	1	..	1·1	..	·9	..
Constitutional—						
Rheumatism	12	..	13·6	..	23·6	..
Syphilis	99	..	112·0	..	91·4	..
Scrofula, Phthisis, &c.	17	1	19·2	1·13	10·9	1·67
Scurvy and Purpura	..	..	..	..	·3	..
Anæmia	4	..	4·5	..	6·0	..
Other Diseases of this group ..	4	..	4·5	..	..	..

Continued Fevers were considerably above the average, but *Paroxysmal Fevers* were under it; both forms, however, were more prevalent than in 1868. The excess in the paroxysmal fevers was entirely confined to Trinidad, where the admissions by them amounted to 105 in an average force of 163 men. None of the cases, however, proved fatal.

Yellow Fever.—In the month of February fevers were very prevalent in Port of Spain, Trinidad, and several cases of yellow fever occurred among the civil population. On the 20th of that month a corporal of the 47th Regiment employed in the Commissariat Bakery in the town was attacked, and died in hospital on the 25th. The disease did not then spread to the troops in the barracks. In May it began to assume the form of an epidemic in Port of Spain, and continued to prevail during the three following months. On the 5th July the first case occurred in barracks, and the troops were immediately moved out and encamped on the Savannah, where they remained till the 21st, when, owing to the occurrence of excessively wet weather, they were compelled to return to barracks. During that period eight cases were recorded, five of them being admitted from camp, and three being patients already in hospital. After the return of the troops to barracks seven cases occurred, the last on the 25th August. All the cases, except the one in February, recovered. None of the officers were attacked. There were two cases among the women, both of which recovered, and one among the children, which terminated fatally.

Syphilis.—The admissions by this disease, though above the average of the last ten years, were one-third lower than in 1868. They were more prevalent at Barbadoes than at either of the other stations.

Scrofula, Phthisis, &c.—The proportion of cases was above the average of the preceding period, but only one death was caused by these diseases.

Local Diseases.—*Diseases of the Eye* furnished a high proportion of admissions, from the occurrence of 25 cases of inflammation. Of these 14 were in the detachment of the 47th Regiment at Trinidad, during the months of July, August, and September. They could not be traced to any special exciting cause.

Diseases of the Ear also were very prevalent. Of 15 cases of inflammation of the membrane of the tympanum 13 were reported in the 47th Regiment at Barbadoes, but no remarks were made respecting them in the Report of the Medical Officer in charge. We have on former occasions called attention to the prevalence of this disease in the West Indies.

Diseases of the Digestive System were the cause of 89 admissions per 1,000 of the strength. Diarrhœa was the most prevalent disease of the class, but the admissions by it and dysentery were much under the previous average. Colic and dyspepsia were the other most prevalent affections.

Diseases of the Urinary System gave the highest number of cases in the subdivisions of local diseases, owing to the prevalence of gonorrhœa at Barbadoes. Of 93 admissions for that disease 82 took place at Barbadoes. *Windward and Leeward Command.*

Diseases of the Cutaneous System were a source of considerable inefficiency, the admissions having amounted to 94 per 1,000 of the strength. Ulcers and boils were the chief affections.

Poisons.—Under the head of *delirium tremens* 15 cases were admitted, and eight under alcoholic poisoning, but none of them proved fatal.

Accidental Injuries differed but little in amount from previous years, and caused no death. An attempt at suicide by firearms was admitted into hospital. It was found necessary to amputate the left arm at the shoulder joint, which was done with success.

The stations occupied by white troops during the year were St. Ann's, Barbadoes, Trinidad, and St. Vincent's. The admissions and deaths in each of these, per 1,000 of mean strength, were as follows :—

	Ratio Per 1,000 of mean strength.	
	Admissions.	Deaths.
Barbadoes	866·7	3·17
Trinidad	2142·8	12·42
St. Vincent's	591·4	..

The admissions into hospital in Trinidad were greatly in excess of the other two stations, the difference being chiefly in fevers, which were the cause of more than half the admissions in that island. The remittent was the most prevalent form, 105 having been so returned out of a total of 182 cases. At Barbadoes the ratio of admissions was kept up by the prevalence of venereal diseases, which were the cause of one-third of the admissions into hospital among the white troops there. Compared with the results for 1868, the sickness at Barbadoes and St. Vincent's has undergone a reduction, while at Trinidad it has been more than doubled.

2.—Black Troops.

During the course of the year the 4th West India Regiment was disbanded and was replaced by the head-quarters of the 2nd from Jamaica. These two Corps, with the military labourers, constituted the coloured force employed. The average strength for the year was 453 ; the admissions into hospital were 414, and the deaths 4, being in the ratio of 914 and 8·83 per 1,000, the former considerably above, and the latter less than half the proportion in the preceding year.

The following Table, framed from Abstract No. 16 in the Appendix, shows the admissions and deaths by classes of diseases :—

Windward and Leeward Command.

Orders.	Black Troops. Diseases.	1869. Strength 453. Admitted.	Died.	Ratio per 1,000. Admitted.	Died.
	I. *General Diseases.*				
1	Febrile Group..	28	..	61·8	..
2	Constitutional „	168	3	370·9	6·62
	II. *Local Diseases.*				
	Diseases of the—				
1	Nervous System	12	1	26·5	2·21
2	Eye	4	..	8·8	..
5	Circulatory System	1	..	2·2	..
6	Absorbent „	3	..	6·6	..
8	Respiratory „	7	..	15·5	..
9	Digestive „	18	..	39·7	..
10	Urinary „	61	..	134·7	..
11	Generative „	8	..	17·7	..
12	Organs of Locomotion	5	..	11·0	..
13	Cellular Tissue	6	..	13·2	..
14	Cutaneous System	35	..	77·3	..
	III. *Conditions, &c.*				
	Debility	1	..	2·2	..
	V. *Injuries.*				
2	Accidental..	57	..	125·8	..
	Total	414	4	913·9	8·83
	Average of 10 years 1859-68	..	..	919·3	21·15

The admissions closely corresponded with the average of the preceding ten years, but the deaths amounted to only two-fifths of the average.

General Diseases furnished nearly half the cases; only one-seventh of the admissions by this class were of the febrile group, presenting in this respect a marked contrast to their relative proportion among the white troops. The admissions and deaths by the chief diseases in each group were as follows:—

Windward and Leeward Command.

General Diseases.	Admitted.	Died.	Annual Ratio per 1,000 of Mean Strength.			
			1869.		1859-68.	
			Admitted.	Died.	Admitted.	Died.
Febrile—						
Eruptive Fevers	..	..	..	..	16·2	·24
Continued „	3	..	6·6	..	15·8	·83
Paroxysmal „	20	..	44·2	..	71·0	1·42
Influenza	5	..	11·0	..	5·5	..
Erysipelas	..	..	..	..	·2	..
Constitutional—						
Rheumatism	26	..	57·4	..	76·9	·36
Syphilis	132	..	291·4	..	121·4	..
Scrofula, Phthisis, &c.	9	3	19·9	6·62	20·3	7·01
Scurvy and Purpura	..	..	..	..	·1	..
Anæmia	1	..	2·2	..	·7	..

There were no admissions by eruptive fevers, and those by continued and paroxysmal fevers did not greatly exceed half the average of the preceding ten years. They however did not differ much from the amount in 1868. The admissions by rheumatism were higher than in 1868, but 20 per 1,000 under the average of the last 10 years. Syphilis was more than double the average, and considerably above the ratio in the preceding year. From the Quarterly Returns we find the average number constantly in hospital from syphilis to have been 17·62 per 1,000 of the strength; the loss of service caused by it to have been equal to 6·44 days of the whole black troops; and the average duration of the cases to have been 23·3 days.

Scrofula and Phthisis corresponded very closely with the average of the preceding years, both in admissions and deaths. All the deaths were by phthisis, and constituted three-fourths of the total mortality of this class, of troops.

Local Diseases.—Those of the urinary system gave the highest ratio of admissions, owing to the cases of gonorrhœa having amounted to 52 or 115 per 1,000 of the strength.

Diseases of the Respiratory System were much below the average.

The proportion of admissions and deaths to strength at Barbadoes and Demerara, the two principal stations of the black troops, was nearly identical, the former having been 913 and 910, and the latter 9·01 and 10·00 per 1,000 of mean strength. The average number of black troops at Trinidad was only 12, and at St. Vincent 9—too few to justify any conclusions from the numbers admitted.

SANITARY REPORT.

Barbadoes.

Surgeon-Major Poole, Principal Medical Officer, Barbados, reports:—

The health of the white troops at Barbados during the year has been excellent, no serious disease of any kind having occurred, either among the troops or civil inhabitants.

The sanitary condition of the troops has been very satisfactory. The several barracks at St. Ann's have been kept clean and in good repair. The new married quarters at the soldiers' brick barracks are a great boon, and would be an additional benefit, on moral and social grounds, if they could be extended so as to provide accommodaton for 40 instead of 20 families. The

Windward and Leeward Command.

quarters of the Staff-Serjeants might, I think, be improved by the addition of a verandah on the west side.

A new ablution and bath room for the men's brick barracks has been erected, containing a double washing range for 24 persons, and two slate baths. Water is laid on by the Bridgetown Water Company.

The ventilation of the barracks is a good as can be expected, but there is room for improvement.

The ventilation of the guard-room and the canteen, Royal Artillery Barracks, has been improved.

The huts occupied by the few married people of the Artillery are old: these should be demolished and new ones built on a modern principle.

The water supply for the bath house attached to the Ordnance Barrack has been increased.

The clothing of the troops is well adapted to the climate. The 53rd Regiment, however, having but recently arrived from Halifax, Nova Scotia, still use the blue serge tunic, which, I understand, will be replaced, in a few weeks hence, by the white tunic now in course of preparation. The battery of the Royal Artillery also, since its arrival, keep in wear the blue serge tunic; but, I think that during the hot season the white tunic would be preferable.

The rations of the troops have been of a fair average, consisting of one pound of bread, one pound of beef each day in the week, except on Wednesdays, when one pound of salt pork is issued, in lieu of the fresh meat. The beef is occasionally hard and tough. I deemed it expedient to submit a recommendation to the Military Authorities, urging the necessity of introducing mutton once, or even twice, a week, as a change. The result is that on the termination of the present contract, 31st March, 1870, my recommendation will be carried into effect, and mutton will be issued to the troops at least once a week.

Black Troops.—This class of troops has been in good health. Three deaths, however, occurred, two from pulmonary consumption, and one from apoplexy in an old military labourer. Venereal was the principal affection among them. The Head-Quarters of the 2nd West India Regiment, a very small force, arrived on the 6th August from Jamaica to replace the 4th West India Regiment, which latter corps was disbanded on the 31st March, 1869.

At the Stone Barracks, Captain Warren's new cooking apparatus has been substituted for the old cast-irons. Only one-half of the occupants can at present avail themselves of the use of the new apparatus.

The European Non-commissioned Officers of the West India Regiments are ill-provided with quarters; the huts are badly placed, exceedingly low, and better accommodation should be made. This subject has been frequently brought under the notice of the proper authorities.

The latrines at the Stone Barracks still continue to be a great nuisance and constant source of complaint. They should, without loss of time, be replaced by others of modern construction, and capable of being properly flushed.

Garrison Hospital.—The Buildings are kept in good repair, no overcrowding of any kind, and there has been ample cubic space.

The white troops are treated in the upper flat, and the blacks in the lower.

New baths, ablution rooms, and closets, having water laid on in connection with section 3 of the main drainage leading to the sea: these consist of four water closets, two urinals, two slop sinks, two baths, and two ablution tables for two persons each.

On the 1st December, 1869, a lock hospital was opened, about one mile distant from the Garrison, by the Civil Authorities, half of the expenses having been defrayed by the Home Government.

Trinidad.

Staff-Surgeon J. Crosse Johnston, the Senior Medical Officer at Trinidad, reports— *Windward and Leeward Command.*

The year has been characterised by unusual drought and by continued heat during the (usually) comparatively cool months of January and February. The advent of the rains, after a protracted dry season, was associated with an outbreak of epidemic fever attacking all races and classes of the community.

The characteristic features of Trinidad are a large proportion of swamp, marsh, or lagoon; the existence of a vast proportion of uncultivated forest, crowded with the products of a redundant tropical vegetation, and the presence of mountain ranges, which intercept the free sweep of the prevailing wind. Omitting any consideration of the geology of the island at large, the semi-circular plain occupied by the capital town and barracks is composed of detritus washed from the surrounding hills (which are composed of limestones, shales, micaceous slates, and ferruginous clays), as well as alluvium deposited by two rivers traversing the plain, and by the waters of the Gulf of Paria.

The prevailing wind is from S.E., veering to E. and N.E., and blows for nearly seven months in the year. In its course it sweeps over the delta of the Orinoco at a great distance, and over an extensive swamp in the immediate neighbourhood of the town, loading the air with malaria. Malarial fever, endemic or epidemic, is consequently never absent. Dysentery is also rather common amongst the civil population.

St. James' Barracks, situated on a level, but 37 feet above the sea, are nearly broadside on to the prevailing south-easterly wind. The situation is decidedly unhealthy, as there exists a very large swamp at a distance of three miles to the S.E., and a lesser one at less than a mile in a westerly direction.

The soldiers' barracks consist of a central block and right and left wings. There are two floors, each containing a single room in the wings, and in the centre an upper room occupied by the detachment of Royal Artillery, and the lower used as a reading-room and library. Each wing is encircled by a verandah on both floors; the basement, which should be open, is enclosed by the main walls, and is divided into stores.

The position of the doors and windows, which are numerous, and opposite to each other, is admirable for the puposes of ventilation. There is abundant cubic space and sufficient movement of air. Notwithstanding that the lower rooms are somewhat deficient in height, the general construction may be termed excellent.

The men were encamped in the neighbourhood for 16 days in consequence of an epidemic of fever, and before the re-occupation of the barrack-rooms they were limewashed, &c., at my recommendation.

The ablution room is rather limited in size; the floor is made of asphalte, which, being worn into holes here and there, retains a considerable amount of water. The basins in use are 26 in number, with nine water-taps. The bath is not sufficiently large for a tropical climate, its dimensions being but 14 feet in length by 9 feet in breadth. The size of the supply pipes is also inadequate for renewing the water in the bath with the desirable rapidity. There is no available place for out-door bathing.

The present means of cooking are by two of Captain Warren's single-boiler apparatus, which superseded six of Dean's steel boilers. The existing arrangements are admirable, and admit of every variety of cooking.

The latrines are all closets upon Jennings' patent. The supply of water is good, and the working of the closets and urinals perfectly satisfactory.

The water supply, which is derived from the public reservoir at Maraval, is excellent, and of good quality. The water used for drinking and cooking purposes is first passed through drip-stone filters, the cavities of which are filled with gravel and charcoal, or, as at present, charcoal only. The only suggestion made was as to the frequent renewal of the charcoal, a point which had not been attended to.

The Sanitary arrangements have been well attended to, and the only local improvement likely to be of benefit would be the piercing of the masonry in the enclosed basement by large openings (as large as is consistent with the

Windward and Leeward Command.

safety of the buildings) for the purpose of free ventilation and the promotion of dryness.

The ration has consisted as heretofore of 1 lb. of fresh beef and 1 lb. of bread daily, excepting on Wednesdays, when 1 lb. of salt pork is issued in lieu of the fresh meat. Vegetables have been added daily to the ration in sufficient quantity, with the exception noted below. The rations were alternately baked, boiled, and stewed.

The dietary appears to be sufficiently varied and nutritive. No recommendations have been made on the subject. The habitual use of green vegetables would be desirable, but the supply is deficient, and the expense rather beyond the means of the men.

With regard to the occurrence of disease, fever, manifestly of malarial origin, has prevailed, and presented some variety of type, varying from ephemera of but one day's continuance, to simple continued fever, ague, remittent, and malarial yellow fever. The causes are not to be found in overcrowding, deficient ventilation, or any similar insanitary condition, but in climate, and the constant presence of malaria in the atmosphere. Some influence must be attributed to the abuse of spirituous liquors, and an attempt was made to check this by limiting the sale of rum at the canteen. The effect of this measure was, however, unsatisfactory, as the men, when allowed out of barracks for recreation, appear to have supplied themselves with adulterated and semi-poisonous substitutes.

There have been no cases of phthisis.

It has been observed that patients in hospital, no matter for what disease admitted, are liable to be attacked by fever. The predisposing cause cannot be found in any insanitary condition associated with the hospital, but appears to depend upon the general condition (plus want of exercise and confinement), which induce fever in the colony at large. The step taken was the treatment of the sick, as much as possible, and all cases of fever in hospital marquees erected within the barrack enclosure. These tents were kept in use for three months.

No special insanitary conditions, other than those incident to faulty situation and insufficient elevation, can be attributed to the admirable barracks at this station. The water supply is adequate, and its quality good; the food is wholesome and sufficient in quantity; the ventilation is perfect, the duties light, the clothing not unsuitable, and the system of conservancy admirable. The conditions which dispose to disease are those over which no control can be exercised, and consist in climate, extreme temperature, miasmata, tropical vegetation, and obstructions to free ventilation, caused by the mountain ranges.

II. Jamaica.

STATISTICAL REPORT.

1. White Troops.

Jamaica.

In the middle of November the 4th Battery 1st Brigade Royal Artillery from Nova Scotia replaced the 7th Battery, which proceeded to England, and on the 31st December the 84th Regiment embarked for Nova Scotia, being relieved by the 29th Regiment from that station.

The average strength of the white troops during the year was 825; the admissions into hospital were 511, and the deaths 19, including one among the invalids sent to England. These numbers give the proportion of 619 admissions and 23·02 deaths per 1,000 of mean strength, the former being slightly above, and the latter more than thrice the ratio in the preceding year, although very little above the average of the last ten years.

The admissions and deaths by each disease are stated in Abstract No. 15 in the Appendix, from which the following classified summary has been framed:—

Order.	Diseases.	1869. Strength, 825. Admissions.	Deaths. In Jamaica.	Deaths. Of Invalids.	Deaths. Total.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.
	I. *General Diseases.*						
1	Febrile Group..	102	12	..	12	123·6	14·54
2	Constitutional ,, ...	49	1	1	2	59·4	2·43
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	8	1	..	1	9·7	1·21
2	Eye	5	..	..	..	6·1	..
4	Nose	1	..	..	..	1·2	..
5	Circulatory System	13	1	..	1	15·8	1·21
6	Absorbent ,, ...	12	..	..	..	14·5	..
8	Respiratory ,, ...	21	..	..	..	25·5	..
9	Digestive ,, ...	60	..	..	..	72·7	..
10	Urinary ,, ...	47	1	..	1	57·0	1·21
11	Generative ,, ...	9	..	..	..	10·9	..
12	Organs of Locomotion	6	..	..	..	7·3	..
13	Cellular Tissue	7	..	..	..	8·5	..
14	Cutaneous System	43	..	..	..	52·1	..
	III. *Conditions, &c.*						
	Debility	2	..	..	..	2·4	..
	IV. *Poisons.*	26	1	..	1	31·5	1·21
	V. *Injuries.*						
2	Accidental..	100	1	..	1	121·2	1·21
	Total	511	18	1	19	619·4	23·02
	Average of 10 years 1859–68	..	..	..	..	1023·2	21·00

GENERAL DISEASES have been the cause of three-tenths of all the admissions into hospital; two-thirds of the cases were of the febrile, and one-third of the constitutional group, but the deaths were all but one in the former. The following Table shows the prevalence of the chief diseases comprised in this class :—

Jamaica.

General Diseases.	Admitted	Died.	Ratio per 1,000 of Mean Strength. 1869. Admitted	1869. Died.	1859–68. Admitted	1859–68. Died.
Febrile—						
Eruptive Fevers	..	..	..	..	·6	..
Continued „	33	..	40·0	..	96·5	2·61
Yellow Fever	14	11	17·0	13·32	13·6	6·23
Paroxysmal Fevers	54	1	65·4	1·21	129·9	2·32
Influenza..	..	..	..	..	9·1	..
Erysipelas	1	..	1·2	..	·6	..
Constitutional—						
Rheumatism	7	..	8·5	..	30·5	·14
Syphilis	37	..	44·8	..	49·6	..
Scrofula, Phthisis, &c.	3	1	3·7	1·21	9·8	1·74
Scurvy and Purpura	..	..	..	..	·3	..
Anæmia	..	..	..	..	·9	..
Other diseases of this group ..	2	..	2·4	..	..	..

The admissions by *continued* and *paroxysmal fevers*, though higher than in 1868, did not exceed half the average of the last ten years, and only one death by them is recorded. One-third of the cases of paroxysmal fevers occurred in a detachment of the 84th Regiment at Up Park Camp during the last two months of the year. Yellow fever, however, proved a cause of great mortality, the deaths by it having been more than double the average of the preceding ten years. The disease broke out in a detachment of the 84th Regiment, at Mandeville, in the middle of October, with great virulence, six cases, all of them fatal, having occurred between the 17th and 25th in a force of 97 men. Previously to this the detachment had been remarkably free from fever. On the 29th of October the detachment was relieved by a Company of the 3rd West India Regiment, and marched to Up Park Camp, which it reached on the 1st November. An officer, two men, and a boy were taken ill on the march, and admitted into hospital immediately on their arrival: only one of the men recovered. No more cases occurred till the 22nd November, when one case was admitted, which recovered. This man had not been at Mandeville, but was one of a detachment which had come to Up Park Camp from Newcastle a month previously, preparatory to embarkation for Nova Scotia. In December there were three more cases among the men of the Mandeville detachment, one on the 6th and two on the 15th; only one of the latter recovered. Between the 17th of October and 15th December one officer, 12 men, one woman, and one child of this detachment were attacked by yellow fever, and only two of the men recovered. In November, a fatal case of yellow fever occurred in a detachment of Royal Artillery, which had arrived ten days previously from Nova Scotia, and was quartered in Port Royal. The detachment was at once removed to Newcastle, and no more cases occurred in it. Altogether there were 14 cases of yellow fever reported among the white troops throughout the Command, and 11 of them terminated fatally. A careful inquiry on the spot led to the conclusion that the disease at Mandeville was of local origin. All the cases at Up Park Camp except one, and that not fatal, occurred in men who had been serving with the detachment at Mandeville.

Rheumatism.—The admissions were extremely low.

Syphilis was slightly under the average of the last ten years, but the proportion of admissions differed very little from that of 1868. A Contagious Diseases Act has been passed for the island, but has not yet been brought into operation.

Scrofula and Phthisis.—The admissions and deaths by these diseases have been below the average; but when the numbers under observation are so small, considerable fluctuations may be expected.

Local Diseases do not seem to require any lengthened comment. The troops continued to enjoy an exemption from ophthalmia, only four cases of it

having been admitted. Under diseases of the circulatory system there was a slight increase, due to 12 admissions from palpitation of the heart, unattended by organic disease. The admissions by dysentery and diarrhœa corresponded closely with the results for 1868, and were much under the previous average. Gonorrhœa prevailed to almost exactly the same extent as in 1868 ; the cases amounted to 51 per 1,000 of the strength.

Under the class of poisons 11 cases of *delirium tremens* have been returned, all of which recovered, and 15 and a death of alcoholic poisoning. Most of the latter cases are believed to have been such as under the old classification were returned under the head of intemperance. The fatal case was that of a man of the 84th Regiment, who died from excessive intoxication at Up Park Camp on the day of his arrival from England.

Accidental Injuries.—The admissions were more numerous than in 1868, but under the average of the last ten years. One only proved fatal, a case returned as contusion, in which, after death, rupture of the liver was found.

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2. Black Troops.

The black troops employed in Jamaica during the year consisted of the 3rd West India Regiment with detachments of the 1st and 2nd Regiments, and the additional gunners of the Royal Artillery. Their average strength was 876, and there were 788 admissions into hospital, and 15 deaths among them. These numbers give the ratio of 899 cases, and 17·13 deaths per 1,000 of mean strength, both lower than in 1868, and considerably under the average of the last ten years.

The following Table framed from Abstract No. 16 in the Appendix shows the admissions and deaths by classes of diseases during the year in this portion of the Force.

Jamaica.

Order.	Black Troops. Diseases.	1869. Strength, 876. Admitted.	Died at Jamaica.	Ratio per 1,000. Admitted.	Died.
	I. *General Diseases.*				
1	Febrile Group	102	2	116·4	2·29
2	Constitutional „	223	10	254·6	11·42
	II. *Local Diseases.*				
	Diseases of the—				
1	Nervous System	14	1	16·0	1·14
2	Eye	17	..	19·4	..
5	Circulatory System	7	..	8·0	..
6	Absorbent „	21	..	24·0	..
8	Respiratory „	53	..	60·5	..
9	Digestive „	58	..	66·2	..
10	Urinary „	119	1	135·8	1·14
11	Generative „	3	..	3·4	..
12	Organs of Locomotion	13	..	14·8	..
13	Cellular Tissue	13	..	14·8	..
14	Cutaneous System	78	..	89·0	..
	III. *Conditions, &c.*				
	Debility	1	..	1·2	..
	V. *Injuries.*				
2	Accidental	65	..	74·2	..
4	Self-inflicted	..	1	..	1·14
	VI. *Surgical operations*	1	..	1·2	..
	Total	788	15	899·5	17·13
	Average of 10 Years, 1859–68 ..	..	..	1264·4	26·02

General Diseases were the cause of upwards of two-fifths of all the admissions. Diseases of the constitutional group were twice as prevalent as those of the febrile, being the reverse of their relative proportions among the white troops. The admissions and deaths by the chief diseases in each of these groups were as follows:—

General Diseases.	Admitted.	Died.	Annual Ratio per 1,000 of Mean Strength. 1869. Admitted.	1869. Died.	1859-68. Admitted.	1859-68. Died.
Febrile Group—						
Eruptive Fevers	1	..	1·1	..	6·9	·55
Continued „	81	..	92·5	..	53·3	2·18
Paroxysmal „	19	2	21·7	2·29	219·5	3·00
Influenza	..	..	..	..	5·3	..
Erysipelas	1	..	1·1	..	1·0	..
Constitutional Group—						
Rheumatism	53	..	60·5	..	82·8	..
Syphilis	136	..	155·3	..	199·0	·27
Scrofula, Phthisis, &c.	31	10	35·4	11·41	21·8	6·81
Anæmia	2	..	2·3	..	..	..
Other diseases of this group ..	1	..	1·1	..	..	..

Eruptive fevers furnished only one admission, a case of chicken-pox. *Continued fevers* were less prevalent than in 1868, but considerably above the average of the last ten years; but this excess was more than counterbalanced by the decrease in paroxysmal fevers, which amounted to only one-tenth of the average.

Rheumatism and *Syphilis* though very much more prevalent than among the white troops, were considerably under the proportion in 1868, and one-fourth below the average of the last ten years. Of the cases returned under primary syphilis, 39 are entered as of the constitution-infecting form, and 80 as local venereal sores. Seventeen admissions were recorded from secondary syphilis.

Scrofula and Phthisis were considerably above the average, but the admissions were under and the deaths only slightly over the proportion in 1868. These are certainly the most formidable diseases from which the black troops in the West Indies suffer, and their causes call for careful investigation with a view to ameliorate the conditions which may be found to give rise to them.

Local Diseases.—*Ophthalmia* has been rather less prevalent than in preceding years, although the admissions have been thrice as high as among the white troops. *Diseases of the Respiratory System* were under, and those of the *Digestive Organs* above, the previous average. In the latter class appear 12 cases of hernia, but the Medical Officer explains that they were men who had broken their trusses, and were taken into hospital merely as a measure of precaution while the trusses were being repaired, or the men fitted with new ones. The high ratio of admissions by the *Diseases of the Urinary System* was due to gonorrhœa, of which 101 cases were admitted in a total of 119 of that class. The death was caused by Bright's disease.

Injuries.—The admissions by accidental injuries did not exceed the average. One death by self-inflicted injury was recorded, that of a private of the 3rd West India Regiment, who shot himself at Port Royal.

SANITARY REPORT.

Deputy Inspector-General Fraser reports:—

The prominent sanitary defects at Newcastle are:—1st. Overcrowding of huts, which have averaged 500 cubic feet per inmate instead of 800, with 75 superficial area, as recommended by the Sanitary Commission, which involves additional hut accommodation, with a new distribution for Officers, men, and married soldiers. Meanwhile two new huts, accommodating 25 men each, are

Jamaica. in course of construction. The addition of jalousied verandahs to all the huts, to be used as day rooms and for messing, is also an exigent requirement.

2nd. The surface drainage is generally bad and defective, though it has been in some degree improved, and should be re-laid with impervious gutters extending far down the slopes.

3rd. The offensive cesspit latrines and urinals need not be referred to, as the introduction of the dry earth conservancy has been authorised by the War Office to prevent nuisance and disease.

4th. Camp refuse should be burnt at some fixed place, to prevent its being thrown down the slopes, as there are no ash bins.

5th. The graveyard should be closed without delay, because of its proximity to the huts, and its position to windward.

6th. A new hospital should be constructed, as the present ward accommodation for 27 beds is quite inadequate, necessitating the treatment of sick in the verandah. The average cubic space per bed is about 900 instead of 1,500 cubic feet. The surface drainage, cesspit latrines, and urinals are in the same bad condition as in barracks.

The Royal Artillery has enjoyed admirable health in boarded tents on Farm Ridge, but since June, 50 men have been accommodated in a new, well-ventilated hut, affording 600 cubic feet per bed.

A suitable latrine and urinal, a bath with water laid on, more extended surface drainage, and a cookhouse properly covered and placed near the hut, are exigent requirements, as well as more hut accommodation for the remainder of the battery, and married men with their families; the latter have, I believe, been sanctioned. The black gunners are also in boarded tents.

I have only three suggestions which I would submit as conducive to the moral and physical health of the men:—

1st. As the duties at Newcastle are so very light, the troops might be employed daily, as far as practicable, in cutting down the bush on the cantonment slopes, and in clearing all the Government ground, which should be kept available for encampments, either during epidemics or barrack repairs; further, they should be encouraged and directed to make vegetable gardens, to occupy a portion of time in useful trades or pursuits, either for their own or the public advantage, with the leading object of removing the *ennui* of the soldier's monotonous life on an isolated hill cantonment in the tropics.

2nd. That a light serge jacket should be substituted for the present white drill one, as better adapted to the very frequent damp, and alternations of heat and cold at Newcastle.

3rd. That the soldier should be enabled to drink his beer at a moderate price, to prevent, to some extent, his recourse to rum.

Up Park Camp Barracks have been occupied by black troops during the whole year. Of 12 deaths at Up Park Camp, 10 have been from pulmonary consumption, and only one was of malarial origin.

The sanitary improvements carried out during the year have been the conversion of two cesspit privies into water latrines, flushed into a covered cesspool 500 yards below the barracks. The remainder are to be similarly changed, but I apprehend that the dry earth conservancy would be found far preferable.

A new cooking range has been introduced into the hospital kitchen. The adoption of an evening meal would conduce towards the improved health and comfort of the black soldier, as it does to that of the white. The cutting down of the thick bush in the vicinity of the barracks and hospital, which is a receptacle for much nuisance and refuse, would be a very great improvement to the sanitary condition of Up Park Camp.

On the 23rd October, a Company of the 84th Regiment moved down from Newcastle into barracks, and on the 1st November two more companies arrived from Mandeville, in consequence of an outbreak of yellow fever at that station, and were encamped near Up Park Camp, with salutary results. On the 7th December they were moved into barracks, but yellow fever appearing afresh, they were all encamped again, with similar good effect, until the whole Regiment (84th) embarked on the 31st December for Halifax, Nova Scotia. One Officer, 4 men, 1 woman, 1 boy, and a child died of yellow fever during this period at Up Park Camp, of which number 2 (men) only could be alleged

to be of local origin. I am strongly of opinion that, excepting for reasons of military necessity, Up Park Camp Barracks should never be occupied by white troops for any continued period, and only the upper storey on such limited occasions.

Kingston Barracks have been occupied by a small detachment of the 3rd West India Regiment.

A bath has been added to the ablution room, and it is the intention to convert the cesspit privies into dry earth latrines, in consequence of the complaints of the municipal authorities of the nuisance of the former.

At *Spanish Town* the detachment of 25 men of the 3rd West India Regiment has occupied an excellent quarter, formerly used by the Legislative Council.

Port Royal Barrack has been occupied chiefly by a detachment of black troops, and also a small one of the Royal Artillery. Out of 3 deaths from disease in the former body one was of malarious origin.

The men of the Royal Artillery enjoyed good health until the end of November, when yellow fever proved fatal to a corporal of the battery recently arrived from Halifax, Nova Scotia. The small party (1 Officer, 10 men) were removed on the 30th November to Up Park Camp, and placed in tents to prevent its extension. The Royal Artillery Officer, who contracted the disease at Port Royal, soon after his arrival with the battery, died at Newcastle, where he went before the disease had fully declared itself.

The Royal Naval Hospital, in the immediate vicinity, has been, during this year, seldom exempt from yellow fever, so that white troops must incur some risk from being quartered in this locality, and should, in my opinion be all permanently removed, if practicable, to Newcastle. Under any circumstances the basement storey of the barrack should never be occupied by white troops, nor the basement storey of the Officers' quarters by white non-commissioned Officers.

A suitable ablution room, with fixed basins and a bath, are much wanted, both for the hospital and barrack.

Port Antonio ceased to be occupied on the 6th October, when the detachment of 25 men of the 3rd West India Regiment were transferred to Falmouth, the special defects of which station are a very small guard-room, an undrained ablution room without fixed basins, and no bath in the barracks. The hospital is also without ablution or bath-room, the dead-house being used for the former purpose.

Mandeville had been always considered an eminently healthy station until the middle of October, when yellow fever suddenly broke out in the detachment 84th Regiment, attacking the men occupying the hut and tents, exempting the barrack. The disease proved fatal to 6 men before their relief by a company of the 3rd West India Regiment. One Officer, 2 men, one woman, and a boy, seized on the line of march, died subsequently at Up Park Camp. The disease seemed to have been immediately connected with, or induced by, the offensive miasmata escaping from fœcal deposits taken from the barrack latrines, partially or imperfectly buried for about four years in a low, shut in, undrained swampy piece of ground, 30 yards square, to windward of barracks, where the smell was very perceptible at night for about a fortnight previously.

In a special Report by the Commanding Royal Engineer and myself, I recommended that, under any circumstances, this hired barrack or site should never be again occupied by white troops, and that a new barrack should be erected in a suitable position. Further, that the infected locality should be covered with three feet of earth.

(N.B.—Deputy Inspector-General O'Flaherty on a previous occasion called attention to the defective latrine arrangements at this station, and urged the adoption of an improved system of conservancy.)

The Contagious Diseases Act became law in Jamaica on the 16th July, 1867, but it has not been carried into operation. I believe that some practical arrangement has been made between the Imperial and Colonial Government on this subject.

There are no nocturnal ablution arrangements.

There is the usual prevalence of venereal diseases among the black troops at Up Park Camp, though not to the same extent among the white troops at Newcastle.

III. Bahamas.

STATISTICAL REPORT.

Bahamas. The number of European non-commissioned officers employed in these islands was five, of whom one died of yellow fever.

The average strength of the black troops, consisting of eight additional gunners Royal Artillery, and a detachment of the 2nd West India Regiment, was 319, among whom 392 admissions into hospital and 11 deaths occurred during the year, being in the ratio of 1,229 and 34·37 per 1,000 of mean strength, both above the average of preceding years.

The diseases by which the admissions and deaths were caused are detailed in Abstract No. 16, in the Appendix of which the following is a classified summary :—

Order.	Black Troops. Diseases.	1869. Strength, 319. Admitted.	Died.	Annual Ratio per 1,000. Admitted.	Died.
	I. *General Diseases.*				
1	Febrile.. Group	166	3	520·4	9·41
2	Constitutional „	58	5	181·8	15·67
	II. *Local Diseases.*				
	Diseases of the—				
1	Nervous system	7	..	22·0	..
2	Eye	2	..	6·3	..
6	Absorbent system	1	..	3·1	..
8	Respiratory „	24	1	75·2	3·13
9	Digestive „	20	1	62·7	3·13
10	Urinary „	53	..	166·1	..
11	Generative „	7	..	22·0	..
12	Organs of Locomotion	1	..	3·1	..
13	Cellular Tissue	4	..	12·5	..
14	Cutaneous system	12	..	37·6	..
	III. *Conditions, &c.*				
	Debility	2	..	6·3	..
	IV. *Poisons*..	4	..	12·5	..
	V. *Injuries.*				
2	Accidental	31	1	97·2	3·13
	Total	392	11	1228·8	34·47
	Average of 10 years 1859–68	..	..	923·4	26·18

General Diseases occasioned four-sevenths of the admissions and above two-thirds of the deaths. This high proportion of admissions was due to the prevalence of *paroxysmal fevers*, of which there were 159 cases; the mortality was chiefly due to phthisis, of which five cases died, and to remittent fever, which was fatal in two cases. There were four cases and one death of *yellow fever*. Remittent fever became very prevalent among the troops in July, and continued to prevail during the four succeeding months, the greatest number of cases occurring in September. In the middle of August yellow fever appeared

in Nassau; the first case in the garrison occurred on the 25th, the patient being the hospital steward's wife, and this was quickly followed by the cases of an Ensign and a Serjeant of the 2nd West India Regiment. The last case among the troops occurred on the 6th November, but it was not till towards the end of the year that the disease entirely ceased among the civil population. The following Table shows the prevalence and mortality of this disease among the troops :— *Bahamas.*

	Strength.	Cases.	Deaths.
Europeans—			
Officers	14	6	4
„ wives	4	3	2
Non-commissioned Officers	5	2	1
„ „ wives	3	2	1
„ „ children.. ..	6	1	1
Black Troops	292	4	1

The black seem, as usual, to have enjoyed a marked immunity compared with the white troops.

Syphilis was the cause of 40 admissions, being in the ratio of 125·4 per 1,000 of the strength. The admissions and deaths by phthisis and hæmoptysis were eight and four, being in excess of the preceding year. *Ophthalmia*, which was very prevalent in 1868, caused only one admission. The high ratio of admissions by diseases of the urinary system was due to *gonorrhœa*, which furnished 44 cases, being, however, one-third less than in the preceding year.

Poisons.—Of the four cases returned under this class one was *delirium tremens*, and the other three were entered as alcoholic poisoning.

IV. Honduras.

STATISTICAL REPORT.

The average strength of the European non-commissioned officers at Honduras during the year was nine, none of whom died. The black troops consisted of additional gunners Royal Artillery, and three Companies 4th West India Regiment, which, on the corps being disbanded, were replaced by Detachments of the 1st and 3rd Regiments. The average strength was 180, the admissions into hospital were 146, and the deaths five, being in the ratio of 811 and 27·75 per 1,000, and considerably higher than in the preceding year. *Honduras*

The admissions and deaths by classes of diseases is shown in the following Table, framed from Abstract No. 16 in the Appendix :—

Honduras.

Order.	Black Troops. Diseases.	1869. Strength, 180. Admitted.	Died.	Annual Ratio per 1,000. Admitted.	Died.
	I. *General Diseases.*				
1	Febrile Group..	26	1	144·4	5·55
2	Constitutional „	24	1	133·3	5·55
	II. *Local Diseases.*				
	Diseases of the—				
1	Nervous System	3	..	16·7	..
2	Eye	5	..	27·8	..
3	Ear	1	..	5·6	..
5	Circulatory System	3	1	16·7	5·55
8	Respiratory „	9	1	50·0	5·55
9	Digestive „	15	1	83·3	5·55
10	Urinary „	12	..	66·7	..
11	Generative „	4	..	22·2	..
12	Organs of Locomotion	3	..	16·7	..
13	Cellular Tissue	6	..	33·3	..
14	Cutaneous System	13	..	72·2	..
	V. *Injuries.*				
2	Accidental	22	..	122·2	..
	Total	146	5	811·1	27·75
	Average of 10 Years, 1859–68 ..	..	..	911·8	20·61

The admissions, though higher than in 1868, were under, but the deaths were one-third above, the average of the last ten years. Paroxysmal fevers were the only diseases in the febrile group which gave rise to any admissions. The troops enjoyed a marked exemption from syphilis. There was nothing in the prevalence of any of the classes to call for special notice.

Section II.

On the Extent of Invaliding.

West Indies.

There were 17 invalids sent to England during the year from the Windward and Leeward Command, and 16 from Jamaica, being respectively in the proportion of 19·2 and 19·4 per 1,000 of mean strength.

Eight invalids from the Windward and Leeward Command, and 11 from Jamaica, were discharged at Netley, and 32 invalids of the black troops serving in the West Indies and Western Africa were discharged in the colonies. The discharges by invaliding were in the ratio of 9·0 per 1,000 from the Windward and Leeward Command, 13·3 per 1,000 from Jamaica, and 12·1 per 1,000 of the black troops.

The disabilities which gave rise to the invaliding are detailed in Abstract Nos. 15 and 16 in the Appendix, of which the following is a classified summary:—

	White Troops.				Black Troops.
	Windward and Leeward Command.	Jamaica.	Windward and Leeward Command.	Jamaica.	West Indies and Western Africa.
Mean Strength	884.	825.	884.	825.	2,652.
Classes of Disabilities ..	Invalids sent Home.	Invalids sent Home.	Discharged as Invalids at Netley.	Discharged as Invalids at Netley.	Discharged as Invalids in the Colonies
Rheumatism	..	..	..	1	2
Syphilis	1	1	..	..	3
Scrofula, Phthisis, &c. ..	5	1	3	..	10
Diabetes	1	..	1	..	..
Cancer..	..	..	..	..	1
Diseases of the—					
Nervous System	3	2	1	..	6
Eye	..	..	..	..	2
Circulatory System.. ..	3	3	2	2	1
Respiratory „	1	2	..	1	..
Digestive „	..	..	..	1	..
Organs of Locomotion ..	..	1	..	..	4
Cutaneous System	..	3	..	1	..
Debility	..	2	..	2	..
Old age..	..	..	..	..	2
Accidental Injuries	3	1	1	1	1
Surgical operations	..	..	..	2	..
Total	17	16	8	11	32
Ratio per 1,000 of Mean Strength .. { 1869 ..	19·2	19·4	9·0	13·3	12·1
Ratio per 1,000 of Mean Strength .. { 1860–68	29·9	28·7	16·5	17·9	19·5

The numbers sent home as invalids and finally discharged were considerably under the average of the preceding nine years. Scrofula and phthisis were the most frequent causes of invaliding, especially among the black troops, diseases of the nervous and circulatory systems being next in point of frequency.

Section III.

Mean Daily Sick.

The mean daily sick of the European during the year was, in the Windward and Leeward Command, 41, and in Jamaica 28, being in the ratio of 46·4 and 33·9 per 1,000 of the strength; and among the black troops it was, in the Windward and Leeward Command, 18, or 39·7 per 1,000; in Jamaica 62, or 70·8 per 1,000; in the Bahamas 17, or 53·3 per 1,000; and in Honduras 6, or 33·3 per 1,000. The following Table gives the usual deductions based on these numbers:—

West Indies.

		White Troops.		Black Troops.			
		Windward and Leeward Command.	Jamaica.	Windward and Leeward Command.	Jamaica.	Bahamas.	Honduras.
Ratio per 1,000 constantly Sick.	1869 ..	46·38	33·94	39·73	70·78	53·29	33·33
	1859–68 ..	48·32	43·04	47·28	64·70	50·65	34·31
		days.	days.	days.	days.	days.	days.
Mean sick time to each Soldier.	1869 ..	16·92	12·39	14·50	25·83	19·45	12·70
	1859–68 ..	17·64	15·71	17·26	23·62	18·49	12·52
Average duration of the Cases.	1869 ..	15·82	20·00	16·13	28·72	15·83	15·00
	1859–68 ..	14·84	15·36	18·77	18·68	19·83	12·57

The mean daily sick of the white troops was slightly above the proportion in 1868, but was under the average of the last nine years. The proportion among the black troops was lower than in 1868 at all the stations, but in a most remarkable degree in the Windward and Leeward Command, where the decrease may, perhaps, have been due in a great measure to the reduction of the force, and to the opportunity afforded of weeding it on the disbanding of the 4th West India Regiment. The duration of the cases has not differed greatly from the results for 1868, except among the black troops, Windward and Leeward Command; it has, however, been above the average of preceding years with the same exception and that of the troops in the Bahamas.

VI.—ON THE HEALTH OF THE TROOPS SERVING IN WESTERN AFRICA.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

Western Africa.

During the year the average strength of the white non-commissioned officers serving in Western Africa was 11 ; there were 10 admissions into hospital, but no deaths.

The average strength of the black troops for the year was 824 ; the admissions into hospital were 917, and the deaths 39 ; being respectively in the ratio of 1,113 and 47·33 per 1,000 of mean strength, the former slightly under, and the latter greatly in excess of, the proportion in the preceding year.

The strength, admissions into hospital, and deaths among the black troops in each of the subordinate Commands, are shown in the following Table :—

	Average Strength.	Admissions into Hospital.	Deaths	Ratio per 1,000 of Strength.		1859–68. Ratio per 1,000.	
				Admitted	Died.	Admitted	Died.
Sierra Leone ..	330	427	9	1293·9	27·27	998·1	29·44
The Gambia ..	138	117	19	847·8	137·69	1147·7	33·00
Lagos, and The Gold Coast	356	373	11	1047·7	30·90	1494·7	45·88

☞ The admissions were lower at Lagos and the Gold Coast, but higher at the other stations than in 1868. There was a slight decrease in the deaths at Sierra Leone, but a very large increase at the Gambia, arising from the prevalence of cholera there in an epidemic form.

The admissions and deaths at each of the subordinate Commands, by the different classes of diseases, are shown in the following Table, compiled from Abstract No. 17 in the Appendix.

Orders.	Diseases.	Sierra Leone.				Gambia.				Gold Coast and Lagos.			
	Stations	330.				138.				356.			
	Mean Strength			1869.				1869.				1869.	
				Annual Ratio per 1,000.				Annual Ratio per 1,000.				Annual Ratio per 1,000.	
		Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*												
1	Febrile.. Group	31	..	93·9	..	21	14	152·2	101·45	46	1	129·2	2·81
2	Constitutional ,, ...	150	4	454·5	12·12	18	1	130·4	7·25	73	1	205·1	2·81
	II. *Local Diseases.*												
	Diseases of the—												
1	Nervous System	3	..	9·1	..	1	1	7·3	7·25	4	..	11·2	..
2	Eye	2	..	6·0	..	5	..	36·2	..	8	..	22·5	..
3	Ear	..	..	..	..	..	..	..	..	1	..	2·8	..
5	Circulatory System	..	..	..	..	1	..	7·3	..	2	..	5·6	..
6	Absorbent ,, ...	3	..	9·1	..	..	..	..	..	10	..	28·1	..
8	Respiratory ,, ...	25	1	75·8	3·03	14	1	101·4	7·25	9	1	25·3	2·81
9	Digestive ,, ...	48	1	145·5	3·03	12	2	86·9	14·49	47	3	132·0	8·42
10	Urinary ,, ...	47	2	142·4	6·06	17	..	123·2	..	30	1	84·3	2·81
11	Generative ,, ...	5	..	15·2	..	..	..	..	..	3	..	8·4	..
12	Organs of Locomotion	10	..	30·3	..	1	..	7·3	..	3	1	8·4	2·81
13	Cellular Tissue	8	..	24·2	..	3	..	21·7	..	47	2	132·0	5·62
14	Cutaneous System	45	..	136·4	..	13	..	94·2	..	56	..	157·3	..
	III. *Conditions*, &c.												
	Debility	3	..	9·1	..	..	..	..	..	..	..	..	..
	IV. *Poisons*	1	..	3·0	..	..	..	..	..	..	..	..	..
	V. *Injuries.*												
2	Accidental	41	1	124·2	3·03	11	..	79·7	..	34	1	95·5	2·81
	Diseases not stated	5	..	15·2	..	..	..	..	..	..	..	..	..
	Total	427	9	1293·9	27·27	117	19	847·8	137·69	373	11	1047·7	30·90
	Average 10 years 1859–68	..	..	998·1	29·44	..	..	1147·7	33·00	..	..	1494·7	45·88

Western Africa.

General Diseases have furnished one-third of all the admissions at the Gambia and Gold Coast, and three-sevenths at Sierra Leone, and to them the very high rate of mortality at the Gambia has been due.

The numbers employed at the different stations are so small that it seems unnecessary to give a detailed Table of the general diseases at each of them; it may be sufficient to state that of the *febrile group* the admissions by paroxysmal fevers amounted to 82 per 1,000 of the strength at Sierra Leone, and 118 per 1,000 at Lagos and the Gold Coast, while there were no cases recorded at the Gambia. At the latter station, however, cholera broke out in May, and furnished 21 cases and 14 deaths among the black troops, being in the ratio of 152 and 101·4 per 1,000 of mean strength. In the previous November, cholera appeared in the French Settlement at Senegal, where it was believed to have been introduced by a Moorish trading caravan, and where it raged with great severity. In the beginning of March it broke out at M'Carthy's Island, in the river Gambia, and there also it proved very fatal. In the beginning of May it reached St. Mary's, the first case being that of a woman who had gone to attend her husband and sister during a fatal attack of cholera at a trading station between M'Carthy's Island and St. Mary's, and who, evading the quarantine, returned to Bathurst, St. Mary's, and died of the disease the day after landing. The whole of this woman's family died of cholera in a few days. The first case among the troops occurred on the 5th of May, in a patient under treatment in hospital for ophthalmia, and proved fatal in nine hours. On the 6th the detachment was broken up into three parties, one being sent to Cape St. Mary's, eight miles, and another to Fort Bullen, three miles distant, while the third remained at Bathurst. The detachment at Fort Bullen escaped the disease entirely; in the other two detachments 19 men were attacked, of whom 12 died, and two women and one child died. The disease prevailed among the troops from the 5th of May till the 10th of June, and during that time, of 146 men, 21 were attacked, and 14 died, by it. The mortality among the black civil population is stated to have been very great, the deaths having amounted in eight weeks to about 1,700 in a population not exceeding 5,000.

The *Constitutional Group* was the source of considerable inefficiency, particularly at Sierra Leone from rheumatism and syphilis, and at Lagos and the Gold Coast from rheumatism. At Sierra Leone the admissions by syphilis were as high as 315 per 1,000, and those by rheumatism 88 per 1,000; and at Lagos and the Gold Coast those by rheumatism were as high as 140 per 1,000 of mean strength. The admissions and deaths by scrofula and phthisis were very high at Sierra Leone, having been 48·5 and 12·12 per 1,000 respectively. Of local diseases those of the Digestive System furnished the highest proportion of admissions at Sierra Leone and the Gold Coast, from the prevalence of diarrhœa at the former and dysentery at the latter. Diseases of the Urinary System were next in point of frequency at these stations, and were even more prevalent than those of the digestive system at the Gambia, gonorrhœa being the chief cause.

Guinea Worm, which appears among the diseases of the cellular system, occasioned 28 admissions and one death on the Gold Coast, being in the proportion of one admission in every 10 of the strength. The fatal result was caused by extensive sloughing in the leg and thigh. No cases were admitted at the other stations.

In the Diseases of the Cutaneous System ulcers were the cause of numerous admissions, particularly at Sierra Leone and the Gold Coast.

Invaliding.

The invaliding from Western Africa has been already shown along with that from the West Indies.

SANITARY REPORT.

Sierra Leone.

Staff Surgeon Gore, the Senior Medical Officer in charge, reports:—

"During the dry season, probably in the majority of instances from exposure to direct solar heat, the ardent form of fever is that which occurs; but as a rule at this season there is little sickness. At its commencement,

Western Africa.

when the Harmattan or easterly wind prevails, colds and attacks of coryza are common; this wind, by checking the cutaneous evaporation, renders congestion of the internal viscera, especially of the liver and kidneys, and of the intestines, prevalent. In the wet season, from the great humidity of the air, rheumatism, particularly in the chronic form, prevails extensively, as well as fevers of various kinds. The Harmattan has a favourable influence in arresting the spread of variola, and a heavy rainfall has almost invariably, in Freetown, stayed the onward course of yellow fever. The fever of the wet season is congestive in type, particularly of the cerebral venous system, which condition usually proves the ultimate cause of death. The year has been a favourable one, and comparatively little sickness prevailed, at least of those forms attributable to the effects of climate, with the exception of rheumatism.

"Freetown is situated upon a gentle incline on the south side of the Sierra Leone estuary, the land gradually ascends for about three-quarters of a mile to a semi-circular range of mountains, which surround it on the E., S., and W. The land, viewed from the sea, appears to consist of high pyramidal hills, each one rising higher than the other. Tower Hill, upon which the barracks are situated, lies in the hollow of the amphitheatre. The geological formation is a primary granitic rock, with a secondary formation of iron-stone, apparently the result of disintegration of the former. The soil upon the hills is poor, chiefly the débris of iron-stone, containing a large quantity of iron in its composition; in the valleys it consists of rich vegetable black mould with an intermixture of iron earth. The vegetation consists of the usual tropical plants, shrubs, and trees; a great variety of the palm tribe prevailing over the others. The productions are Indian corn, ground nuts, rice, arrowroot, ginger, palm nuts, palm oil, peppers, bananas, pine apples, and a variety of tropical fruits. European vegetables are grown upon the hills. Numerous mountain-streams provide a pure and abundant supply of water. Marshes exist in the low-lying situations. There are two seasons—the dry and wet; the former from November until May, the latter in the intervening months. Tornadoes usher in the advent as well as the cessation of the rains. The Harmattans blow at intervals during December and January; the hottest period is the interval included in the months of February and March. Hot sultry days prevail at the commencement and cessation of the rains, usually followed by tornadoes towards evening. The latter reduce the temperature and render the air much more refreshing.

The diseases are endemic and epidemic, consisting of different forms of malarial remittent fever. Intermittents also prevail during the rainy months. Very few residents escape one or other of these different developments of the malarial poison during the year. Some in the rains suffer from repeated attacks of ague, either arising spontaneously or as the sequelæ of remittents. Acute hepatitis is rarely seen; but the chronic form is not infrequent. Splenitis is not so common as in the less hilly regions of Africa; but in the neighbouring rivers is of frequent occurrence. The natives suffer little in comparison with the European from malarial diseases. Chest affections, rheumatism, scrofula, and leprosy are the disorders most frequently observed amongst them. The only one peculiar is "lethargus," to which affection a few occasionally succumb. The epidemic diseases are yellow fever, variola, and catarrh. The first affects nearly altogether the European, and appears at uncertain intervals of time, usually at the end or commencement of the rains, when it causes great mortality. Variola is endemic, but occasionally becomes epidemic, and causes numerous deaths among the natives. Catarrh has been epidemic during certain years. Most chronic affections seen in the Europeans bear the impression of malarial influence; nearly every native bears the marks of previous ulceration of the lower extremities, to which they are very subject. Chronic dysentery and diarrhœa now and then prevail. The acute form is very rare.

"The barracks are situated upon an isolated conical hill, rising to a height of 375 feet within the hollow of the amphitheatre of the mountain ranges; the position is the most healthy and convenient that could have been chosen. The hollow intervening between these and the range of hills is principally occupied by native hovels; it is marshy, and the drainage of it defective. The barracks consist of three principal blocks, two occupied by the men, the most

southerly one by the officers. A new hut has been recently erected and is now occupied by a company of the regiment. The Staff and European Serjeants are accommodated in a modern building, erected on a space at the north extremity of the plateau. Each block consists of two stories, the upper divided into three rooms, which the men inhabit; the lower into a similar number of rooms, principally occupied by the families of the married soldiers. The general construction of the rooms is suitable, and conducive to health. The old blocks occupied by the men require re-arrangement of the windows. They are now capable of being closed at pleasure, which the men will always do at night during the rains; the upper portions should be quite open, or have perforated zinc adapted to them. Inlet and outlet shafts are also required. Coal-pots are the only means of warming; they are used when necessary during the wet season.

"There is no bath accommodation. Tin water-basins have been supplied for purposes of ablution. The system of conservancy is the old one of cesspits, which lie to the rear of the barrack wall; they are at times offensive, especially during easterly winds.

"The water supply has been obtained from tanks in the barrack-yard during the rainy months; during the dry ones, it is carried by labourers from a stream flowing from the neighbouring hills. It will be shortly brought by means of pipes from the latter, the charge necessary for their construction having been allowed in the Estimates.

"From its central position as a coaling station, Sierra Leone presents many advantages for the quartering of troops over the other portions of the Command. Supplies, such as they are, are plentiful; meat and the various tropical vegetables being obtainable, and not at an expensive rate, in abundance. Communication with Europe and the other stations is frequent by means of steamers and sailing vessels. Owing to the position of the barracks, the officers and men occupying them can be at once isolated from the town during an outbreak of epidemic disease. These buildings afford ample accommodation; are well situated for ventilation and drainage. Sites for temporary encampment can be at once found in a favourable situation upon the neighbouring hills when required, and at an elevation not obtainable at any other portion of the coast. The water is pure, and to be got in large quantities. For these reasons as many of the troops as possible should be concentrated at this station, where they would be at once available to be detached to any portion of the Command within a short space of time, and in a much better condition as to discipline and physique than if they were separated in small detachments all over it.

"The following sanitary suggestions for alterations in the buildings, &c., were, at the annual inspection, submitted, with the approval of the Officer Commanding, through the Royal Engineer Department, to the authorities in England for their consideration, in order that the necessary outlay might be included in the next year's estimates:—

"1. Latrines: bottom of cesspits to be filled up with concrete, upon which should be placed a smooth flag or slab to render them easily cleansed, trap-doors carefully adapted to apertures behind, to prevent easterly winds blowing effluvia to buildings upon their front. 2. Substitution of a staff of labourers for cleansing by contract. 3. Two light hand carts to carry soil to a distance or into the sea. 4. Latrine built for new pavilion. 5. Stables: window facing latrine to be closed to prevent sewerage air passing through; ventilating ridge along the summit, re-arrangement of side windows to ensure more perfect ventilation. 6. Officers' quarters: new leads. 7. Hospital: increased accommodation required. 8. Barracks require painting. 9. Cookhouse: oven built to enable diet to be varied."

Gambia.

Staff-Surgeon Thomas reports:—

"Unfavourable conditions of life and vicious systems of conservancy afford grounds for fearing that cholera and enteric disease may become endemic in

Western Africa.

this settlement. Although there is a considerable rainfall during the wet season, no tanks exist for storing the water. The brackish impure water used by the inhabitants of this island is obtained from shallow wells sunk in the sandy soil. The land is so low that effective drainage is almost impossible; and ordure is allowed to accumulate in cesspits, which contaminate the air, soil, and water, in every part of the town."

Lagos.

Staff Assistant-Surgeon Rowe, the Senior Medical Officer at Lagos, thus describes the position and conformation of Lagos, the station to which his report refers:—

"A low-lying sandbank in a tidal lagoon, in the Bight of Benin, on the "West Coast of Africa, surrounded in all directions by miles of mangrove "swamp, alluvial tract, covered at high tide by the sea, and exposed to the in- "fluence of a tropical sun at low water; at only a short distance from the "Equator; so flat as to be little, if at all, capable of drainage; many of the "houses built on land formed artificially, and carried by hand to the place of "deposit; and exposed to a very heavy rainfall during four months of the "year. It will be at once seen that any body of men, European or African, "stationed here, must suffer in their health to a greater or less degree, as do "the civil population (numbering 60,000 to 70,000).

"Still, energetic measures have been taken, and are being pushed on by the "local authorities, for the improvement of the place; and the increase in "revenue, the increase in population, the changed appearance of the wharves, "and the busy circulation of the people, amply attest the wisdom of these "steps, and the untiring perseverance that has been displayed since the first "establishment of the settlement in October 1861."

The detachment of troops landed at this station 6th June, 1866. The only change in their strength since has been the addition of 11 men from Cape Coast Castle, December 20th, 1868, to replace others discharged. It offers, therefore, a particularly good opportunity of contrasting the sickness of different years in the same body of men at the same station. A considerable sanitary change in their condition was made when they were moved on December 23rd, 1867, into the commodious barracks specially built for them, instead of living in a large shed on the ground; and I think to this is due a considerable share of the diminution in sickness.

On October 16th, 1868, the hospital was removed to a more commodious and healthy building, though not, perhaps, in quite so good a sanitary position.

On first coming to this climate the negro from the West Indies suffers considerably, and goes through a process of acclimatisation to the malaria of the place as distinctly as does the European. By continued residence here his vital power is lowered, the attacks of fever become lighter, and put on a much more intermittent type, but his power of resistance to, and recovery from, acute disease, such as dysentery, seem lessened.

The general character of the health of the civil population, European and native, is distinctly improved since our occupation of the island in 1862. Sanitary improvements are perseveringly carried out, and, owing to the advantage of a fixed Government, the value of property has much increased, and commodious houses are being erected in all parts of the town for native as well as in-coming residents.

Negro emigrants from the Brazils, who have been accustomed to come in large numbers, suffer much less on arrival than formerly, when the mortality was enormous. Still, every new comer, even from other parts of the coast, where apparently the same influences prevail as at Sherbro', has to pass through his special seasoning.

Venereal Disease.—There is no local ordinance in force for the prevention of venereal disease.

There is no difficulty about nightly ablution, as the bath-room is always open.

"I have not remarked a special immunity or special spread of the disease, but when once a bubo is opened here, it is peculiarly difficult to heal, and in the European is certain to put on a phagedœnic type.

"All affections implicating the skin are particularly difficult to treat successfully, and indolent ulcers on the legs are endemic, and universal among natives and European, as is also congestion of the spleen and associated discoloration of the skin, poor blood, and inflammation of the sebiparous glands. Immunity from these diseases is the exception, and not the rule. These are indications of a bad climate, the effect of which is to lower the tone of the system, and conduce to early decay, mental and physical."

Section III.

Mean Daily Sick.

The numbers constantly sick during the year were 27·4 at Sierra Leone, 4·2 at the Gambia, and 23 on the Gold Coast and at Lagos. From these numbers the following ratios have been calculated:—

		Sierra Leone.	The Gambia.	The Gold Coast and Lagos.
Ratio per 1,000 constantly sick	1869	68·48	30·44	64·61
	1860–8	41·34	45·33	60·26
		Days.	Days.	Days.
Average sick time to each soldier	1869	25·00	11·11	23·58
	1860–8	16·19	16·55	21·99
Average duration of cases of sickness ..	1869	19·32	13·10	22·51
	1860–8	15·57	13·35	13·91

Compared with the results for 1868 this Table shows a marked increase in all these particulars at Sierra Leone and decrease at the other stations, except in the average duration of the cases on the Gold Coast and at Lagos, which has increased by nearly six days.

At the Gambia the mean daily sick and average sick time to each soldier have been much under the average of the preceding nine years, while at Sierra Leone they have been greatly, and on the Gold Coast and at Lagos slightly, above that average.

VII.—ON THE HEALTH OF THE TROOPS SERVING AT THE CAPE OF GOOD HOPE AND ST. HELENA.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

Cape of Good Hope and St. Helena.

In July the 99th Regiment, and in August the 32nd Company Royal Engineers, left the Command for England. In June a detachment of Royal Artillery arrived at the Cape from Mauritius, and a Company of Royal Engineers at St. Helena from England. A large detachment of the 82nd Regiment also arrived at the Cape *en route* for Mauritius, and was detained during the rest of the year, owing to the great prevalence of epidemic fever at the latter station.

The average strength of the troops during the year was 4,447, of which 446 were stationed in St. Helena. The admissions into hospital amounted to 5,105, and the deaths, including those of 6 invalids, to 52, being in the ratio of 1,148 and 11·69 per 1,000 of mean strength, the former being above, and the latter closely corresponding with the ratio of the preceding year.

The proportion of sickness and mortality furnished by each of the corps serving in the Command was as follows:—

	Average Annual Strength.	Admissions into Hospital.	Deaths.				Annual Ratio per 1,000 of Mean Strength.	
			In Hospital.	Out of Hospital.	Of Invalids.	Total.	Admitted.	Died.
Royal Artillery	399	497	5	2	..	7	1245·7	17·54
Royal Engineers ..	162	227	2	1	1	4	1401·3	24·69
1st Bn. 9th Regiment..	657	541	5	1	3	9	823·4	13·69
2nd Bn. 11th „ ..	717	1,091	5	1	1	7	1521·6	9·76
2nd Bn. 20th „ ..	699	646	5	1	1	7	924·2	10·02
32nd Regiment	581	538	3	..	..	3	926·0	5·16
86th „	228	396	1	2	..	3	1736·8	13·16
99th „	349	518	6	2	..	8	1484·3	22·92
Cape Mounted Rifles ..	450	505	4	..	..	4	1122·2	8·89

The ratio of admissions was very high in the 2nd Battalion 11th, and in the 86th Regiment. In the former the excess was chiefly from venereal diseases, which were extremely prevalent both at Graham's Town and Cape Town where the corps was stationed. It had no fewer than 165 admissions from syphilis, and 256 from gonorrhœa. In the 86th the excess was partly due

to the recurrence of ague among the men who had been sent from Mauritius to the Cape for change of climate after having suffered from epidemic fever, and partly to the prevalence of venereal diseases in the detachment from England, which was detained, as above stated, at Cape Town. *Cape of Good Hope and St. Helena.*

The diseases by which the admissions and deaths were caused are detailed in Abstract No. 18 in the Appendix, from which the following summary has been framed:—

Order.	Diseases.	1869. Mean Strength, 4,447. Admitted.	Deaths. In Command.	Deaths. Of Invalids.	Deaths. Total.	Ratio per 1,000 Admitted.	Ratio per 1,000 Died.
	I. *General Diseases.*						
1	Febrile Group	465	2	..	2	104·6	·45
2	Constitutional „	987	9	4	13	222·0	2·92
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous system	59	7	..	7	13·3	1·57
2	Eye „	220	..	..	..	49·5	..
3	Ear „	13	..	..	..	2·9	..
5	Circulatory system	39	4	1	5	8·8	1·12
6	Absorbent „	57	..	..	..	12·8	..
8	Respiratory „	194	3	..	3	43·6	·67
9	Digestive „	673	12	1	13	151·3	2·92
10	Urinary „	958	1	..	1	215·4	·23
11	Generative „	73	..	..	..	16·4	..
12	Organs of Locomotion	22	..	..	..	4·9	..
13	Cellular Tissue	128	..	..	..	28·8	..
14	Cutaneous system	498	..	..	..	98·5	..
	III. *Conditions, &c.*						
	Debility	38	..	..	..	8·5	..
	IV. *Poisons*	62	1	..	1	13·9	·23
	V. *Injuries.*						
2	Accidental	670	5	..	5	150·7	1·12
3	Homicidal	..	1	..	1	..	·23
4	Self-inflicted	3	1	..	1	·7	·23
	VI. *Surgical Operations*	3	..	..	..	·7	..
	No appreciable disease	3	..	..	..	·7	..
	Total	5,105	46	6	52	1148·0	11·69
	Average of 10 years, 1859–68	..	..	..	..	955·5	10·69

The admissions and deaths in 1869 were above the average of the preceding ten years.

GENERAL DISEASES caused two-sevenths of the admissions; one-third

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of them were of the febrile, and two-thirds of the constitutional group. The following Table shows the prevalence of the principal diseases in this class :—

General Diseases.	Admitted	Died.	Annual Ratio per 1,000 of Strength.			
			1869.		1859–68.	
			Admitted	Died.	Admitted	Died.
Febrile—						
Eruptive Fevers	3	..	·7	..	1·0	·02
Continued „	289	..	65·0	..	49·9	1·13
Paroxysmal „	107	1	24·1	·22	25·1	·17
Influenza	48	..	10·8	..	5·3	..
Erysipelas	17	1	3·8	·22	2·4	..
Other Diseases	1	..	·2	..	..	..
Constitutional—						
Rheumatism	196	1	44·1	·22	45·9	·02
Syphilis	740	1	166·4	·22	125·3	·04
Scrofula, Phthisis, &c.	45	11	10·1	2·48	9·5	1·63
Scurvy and Purpura	..	..	..	..	1·2	..
Anæmia	3	..	·7	..	1·0	..
Other Diseases	3	..	·7	..	..	..

Continued Fevers were more prevalent than in the preceding year. The excess was chiefly in the 99th Regiment at Cape Town, and was not considered to have arisen from any special cause, but to be one of the results of the general insanitary condition of that town.

Paroxysmal Fevers did not exceed the average of the last ten years. They occurred principally in men of the Royal Artillery and 86th Regiment, who had come from Mauritius, where they had suffered from the epidemic malarious fever.

Influenza furnished twice the average proportion of admissions. More than half the cases occurred in the 2nd Battalion 11th Regiment at Graham's Town in the months of January and February.

Syphilis.—The admissions under this head were much above the average of the last ten years, and were slightly in excess of 1868, when the ratio amounted to 162 per 1,000 of the strength. It was most prevalent at Cape Town, but was also a cause of considerable inefficiency at Graham's Town.

Local Diseases.—Those of the *urinary* system furnished the highest proportion of admissions from the large number of cases of gonorrhœa and its consequences. Next in order of frequency were diseases of the *digestive system*, the most prominent of which were dyspepsia and tonsillitis, the former in many instances, it is to be feared, being a consequence of intemperance. Hepatitis was also the cause of a large number of admissions.

Poisons.—In this class are included 59 cases of delirium tremens, being in the ratio of 13·3 per 1,000 of mean strength : all of them recovered ; but one man of the 32nd Regiment died from alcoholic poisoning, having in a very short time drank three quarts of brandy. There were also two admissions on account of poisoning, one by morphia, at the Cape, and the other by the Ricinus Communis, at St. Helena, but no details of the cases have been given by the Medical Officers.

Injuries.—The admissions and deaths by accidental injuries were above the average ; the former were chiefly by contusions, sprains, and slight wounds. Of the deaths three were by drowning, one by multiple injury, the result of a fall 600 feet down an almost perpendicular cliff at James Town, St. Helena, and one by lightning—a Private of the 20th, on parade at Fort Napier ; four other men were struck down at the same time, and were taken to hospital, but they recovered. A homicidal death appears in the Returns, that of a Private of the 86th Regiment, who was accidentally stabbed through the heart with a

bayonet in a scuffle with the picquet, and there was one suicidal death by fire-arms. *Cape of Good Hope and St. Helena.*

The SURGICAL OPERATIONS reported were two amputations of fingers and an amputation of a toe.

SANITARY REPORT.

Deputy Inspector-General Grant reports :—

The principal sanitary defect that I have to notice is the want of proper storage for water in the barracks at Cape Town. Water is supplied by a public company, but it is often necessary to shut off the supply, and no adequate provision is made for keeping a sufficient quantity for use upon such occasions. Tanks of sufficient size, or water barrels properly covered, are much required for this purpose, and the want of them has been frequently represented.

Some improvement has been made in the drainage of the Military Hospital at Cape Town, and also in the Castle ditch, but the latter continues a nuisance, and to remove the sanitary objections which exist to it in its present state, works are required upon a larger scale than the municipal authorities are disposed to undertake.

No change has been made in the scale of the soldiers' ration. I recommended last year, at the instance of the Lieutenant-General Commanding, that the meat ration should be increased from a pound to a pound and a half daily; meat being of inferior quality here, and also very much cheaper than that which is issued in England, but my recommendation does not appear to have been entertained.

A "Contagious Disease Act" has been in operation at Cape Town, Graham's Town, and King William's Town, the three principal stations, but the results have not been so satisfactory as might have been desired, the percentage of cases remaining much the same as before the introduction of the Act. It is to be remembered, however, that the working of the Act was at first experimental, that prejudices had to be overcome, and a system arranged. The results are now more satisfactory than they were at first, certainly sufficiently so to encourage the continuance of the law, which, however, is so far unpopular with some of the inhabitants, that an effort was made in Parliament to abolish it. The reason of this opposition with most is the expense: but some persons here, as in England, object to it on grounds of morality.

Surgeon Lofthouse, in medical charge of the 32nd Light Infantry, reports favourably of the health of the regiment since its arrival at the Cape from the Mauritius. The corps has been stationed at Graham's Town since 1869. Surgeon Lofthouse says :—

"Fever, diarrhœa, dysentery, and ophthalmic diseases, have not prevailed. A few isolated cases of no importance have occurred at times. The remote predisposing cause of the febrile complaints, was the intermittent fever contracted in the Mauritius. The proximate cause of most of these diseases was malaria, arising from putrid matters in the town; the decay being accelerated by heavy showers of rain, and this cause again was strengthened by intemperance and exposure. The few ophthalmic cases that were treated occurred in men of strumous habit, or men who had previously suffered from tarsal inflammation. Inflammation in these cases was readily re-induced, by exposure to the weather, extremes of temperature, and especially to the sun, wind, and dust combined. There has been some little overcrowding of the troops, and some imperfect ventilation."

Assistant Surgeon Jeffcoat, in medical charge 1st Battalion 9th Regiment, at King William's Town, reports :—

"The climate is one of the finest in the world. The heat, though oppressive in Summer, does not continue more than two or three days at a time, and is mitigated by frequent thunder storms, the accompanying rains refreshing the vegetation. The nights are cool. The frequent dust storms are troublesome, and predispose the inhabitants to ophthalmia; no other disease can in any

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way be attributed to the climate. Sunstroke is excessively rare, more so than in England. Phthisical people, in many instances, appear to regain strength by residence here.

The geology of the district consists principally of the metamorphic system, and is one of those instances of the vast extent of formations of this nature. The rock is a kind of clay limestone; the underlying formation is syenitic. The soil is sandy in some places, in others alluvial; the subsoil is clay. The configuration of the country is that of a succession of undulating hills intersected by rivers, and sometimes deep narrow ravines. The hills are covered with herbage and patches of Mimosa bush, there being no forest within several miles of the place. The soil is well adapted for all kinds of grain and vegetables. The Solanaceæ and Cucurbitaceæ are particularly prolific; oranges, peaches, &c., are very plentiful. There is an unlimited supply of beef and mutton, and poultry is by no means scarce. There are no marshes. The principal diseases prevalent among the inhabitants are lepra, worms, rheumatism, ophthalmia, and scrofula, including phthisis pulmonalis. Lepra shows itself either in a red or white eruption or by a gradual absorption of tissue about the hands and feet, and tumours over the malar and frontal bones;—a most distressing form of lepra. Rheumatism is said to be due to the great daily fluctuations of temperature. Ophthalmia may be attributed to dust and exposure to night air, and draught in huts, aggravated by subsequent neglect. Tænia Mediocanellata is the most common tapeworm. Phthisis Pulmonalis is most common among the Christian Kaffirs and Hottentots, owing to their wearing linen and cotton clothing, and still continuing the habit of lying on the ground, at night or during the day; the raw Kaffir who wraps himself in his blanket, is not so liable to suffer from lying on damp ground.

"The barracks are situated on the side of a hill rising from the river, with a gentle slope of 4° at an elevation of 1,775 feet above the level of the sea; the huts run N.E. and S.W.: they are arranged in lines, and are sufficiently far apart for proper ventilation. Each hut is a long one-storied brick building on a stone foundation, and with a slated roof; there is a verandah on the westerly side; the stone foundation is built sufficiently high to allow of perfect ventilation beneath the flooring of the hut. Each contains two barrack-rooms and two serjeants' quarters; each room is 58 feet long, 20 feet broad, and 11 feet high, the walls are plastered externally and whitened internally. As regards height, windows, doors, and general construction, the rooms are such as to be conducive to health. There are two doors and ten windows in each room; the windows open vertically; the flooring is of wood, so is the ceiling; the windows are opposite to each other, and the doors are placed one at each end of the room. Ventilation is obtained by doors, windows, inlet openings at the side, and two large outlet louvred openings in the ridge, which is ample. The climate is so mild that fires are unnecessary. The ventilation of the regimental cells is defective; the matter was referred to the General Commanding in 1868.

"On account of the "Contagious Disease Act" having come into force, there has been a diminution in the number of venereal cases. The reduction in the number of ophthalmic cases is great; if from the number of admissions be deducted the chronic cases which have been treated several times during the twelve months, the number of fresh admissions would be very small. Although the climate is probably one factor in the causes of ophthalmia, I am inclined to believe that constant attention to the sanitary arrangements, especially the washing basins, &c., has conduced much to check the disease.

The construction of the hospital is very defective, and the cubic space and superficial area are too small. It is the intention of Government to build a new hospital on a better site; no alteration would much improve the present one; it is too low, lying between the barrack and the river, is built in the form of a square, so that perflation of air is impeded; the windows are too small, the ceiling too low;—in fact the hospital is in every way inadequate.

The latrines are on the same principle as those in barracks, viz., tubs emptied daily. There is one superficial drain. The water supply is sufficient. It is brought by the commissariat carts from the water works tap in town, and placed in covered vessels.

Cape of Good Hope and St. Helena.

From the foregoing report it will be observed that the regiment during the past year has been very healthy, the number of fatal cases has been small, and, with the exception of venereal and ophthalmic cases, no disease has been very prevalent. The sanitary condition of the barracks and their construction are good; but the drainage is very indifferent, and requires improvement.

Graham's Town.

Staff Surgeon Seddall, in medical charge of detachments of various corps and of the Garrison Staff and Departments at Graham's Town, reports:—

The climate is, on the whole, a healthy one; the excessive heat which is sometimes experienced in the summer season is always relieved by a fall of temperature at night, generally preceded by a thunderstorm or a dust storm; this change gives rise to extremes of temperature within a few hours, attended, however, with no prejudicial effect to the health of individuals.

The detachments included in this Report have enjoyed excellent health during the year, and have been free from diseases attributable to climate.

The physical character of the country is decidedly mountainous and hilly, Graham's Town being situated in a large basin surrounded by undulating land, the highest portion of which is rocky and barren, and the lower portions forming ravines, valleys, and kloofs, being more or less suitable for agricultural purposes; the soil in these localities is clayey, containing deep rich loam. There is very little large wood or timber met with in these districts, but the ravines and kloofs are well stocked with mimosa bushes, cacti, aloes, wild pomegranate, &c. The agricultural productions consist of succulent vegetables of all kinds, potatoes, mealies, oats, wheat, melons, cucumbers, grapes, and fruits of almost every description, wool, wine, and tobacco. There is very little marshy ground, and the country is, on the whole, well watered. The mineral resources of the country are, as far as is at present known, few; indications of coal have been discovered near the mouth of the Kowie River, about 35 miles from Graham's Town; iron-stone and chalk abound extensively, and copper and gold are found in the interior. The old red sand-stone formation prevails throughout this district, volcanic rocks cropping out here and there on high elevations. Graham's Town is in 28° 18′ 30″ S. lat., 28° 28′ 45′ E. long., and 1,700 feet above the level of the sea.

In common with the other towns of this country, Graham's Town is open to considerable improvement on the score of sanitary precautions for the prevention of disease. The town is badly drained, and all the manure and refuse is allowed to collect at the lower portion of the town on the banks of a stream, which ultimately empties itself into the Kowie River. Notwithstanding this apparent drawback to the salubrity of the district, Graham's Town may be considered very healthy, serious epidemics very rarely prevailing, and the mortality, on the whole, being slight. The principal diseases met with are diarrhœa, dysentery, diphtheria, tonsillitis, influenza, and catarrh. There is a comparative immunity from bronchial affections, and, except amongst the native population, who are insufficiently clothed and badly fed, phthisical complaints are very rare.

The barracks occupied by the Royal Artillery and Royal Engineers are situated in the Drodsty, on elevated and sloping ground, and in a healthy locality facing N.N.W., and are one-storied. Those occupied by the Cape Mounted Rifles are at the Cape Corps camp, and face N.E. by N. The former are built of wood, and the latter of stone. The walls and floor of the former are all wood, and those of the latter (a very old building) are stone and concrete. The Royal Engineer Barrack consists of one large room well ventilated, and properly lighted; the rooms at the Cape Corps Camp are smaller, and contain rather small windows; their construction, however, is in no way prejudicial to health. With the exception of some of the rooms in the Cape Corps Camp, which have no fire-places, the remainder of the rooms are sufficiently warmed and properly ventilated. All defects have been mentioned in my monthly reports in my capacity as Sanitary Medical Officer of this station, but the

Cape of Good Hope and St. Helena.

authorities do not consider it expedient at present to make any alterations in the buildings.

All the barracks with the exception of the Royal Engineer Barracks are supplied with ablution and bath accommodation, which has been sufficient and regularly used by the men. There have been no bathing parades, as there is no river or sheet of water in the vicinity which could be made available for the purpose. The cooking arrangements at the Royal Engineer Barracks have been satisfactory in every respect, but the Cape Corps Barracks are deficient in means for roasting or baking; this has been represented. The culinary means consist of boilers and a large sized oven.

The latrines, urinals, ash-pits, &c., have been kept clean and in good order. The night tubs, manure and refuse heaps, are daily removed by a contractor, and quick lime is abundantly used. The condition of the water supply derived from the reservoirs has been excellent, and, with the exception of the water being somewhat muddy after heavy rain, it is very good, and free from impurity. The sanitary arrangements in the barracks have been properly attended to, and no diseases have arisen attributable to defective sanitary measures.

The dietary has been sufficiently nutritive and varied to preserve health, and no changes have been considered necessary. The liquors used by the soldiers, obtained either at the canteen or in the drinking houses in the town, have been beer, ale, porter, Boer brandy, cognac, and other spirits, besides Cape sherry and pontac. The malt liquors may be considered good and wholesome, but other drinks are more or less adulterated, and highly intoxicating.

The clothing, consisting of the usual regimental cloth clothing in winter, and white clothing with puggarees on the forage caps in summer, has been sufficient, and adapted to the climate.

The duties have been varied, and have not been of such a nature as to affect the health of the troops. Various games and sports are resorted to in leisure hours, cricket, foot-ball, quoits, &c. Mental recreation is provided in the shape of reading rooms furnished with indoor games. The erection of a ball court, and the establishment of a gymnasium, are strongly recommended.

The lock-up and guard-room of the Cape Corps Camp are too small and badly ventilated. The defects have not injured the health of the prisoners temporarily detained in them. The Garrison provost and prison cells have ample accommodation, and are in good sanitary condition.

The detachments at this station have been re-vaccinated; no cases of small-pox have occurred amongst them, nor have any infectious disorders been prevalent during the year.

The wards of the hospital occupied by the detachments included in this Return have been well ventilated and properly warmed.

The hospital faces N.E. by N., and consists of a separate block of buildings, close to the Drodsty Barracks. There has been no overcrowding.

From the above Report it will be seen that Graham's Town may be considered, on the whole, an eligible station for troops, possessing a salubrious climate, comparatively free from zymotic diseases, and a range of temperature throughout the year not incompatible with health or comfort.

The Officers, Non-commissioned Officers, men, women, and children, belonging to the Staff at this Military Head-Quarters of the Cape Colony have enjoyed excellent health during the year and no deaths have occurred amongst them during that period.

St. Helena.

Staff Surgeon-Major W. F. T. Ivey reports that a further experience in St. Helena only confirms him in the opinion previously expressed, that the troops would maintain a much higher standard of health and efficiency if they were removed from the close and confined valley position of James Town Barracks, where the men are placed under circumstances not only least favourable to health, but most provocative of diseases due to vice and intemperance: and that, both on hygienic and moral grounds, advantage should be taken of the uplands for the erection of suitable barrack and hospital accommodation.

Section II.

On the Extent of Invaliding.

Cape of Good Hope and St. Helena.

There were 61 invalids sent to England from the Cape and St. Helena during the year, being in the ratio of 13·72 per 1,000 of the mean strength. In the same period there were 8 invalids discharged the Service at the Cape, and 121 at Netley, amounting together to 29·01 per 1,000 of mean strength.

The disabilities of the invalids sent home, and of those discharged the Service, are stated in Abstract No. 19 in the Appendix, of which the following is a classified summary :—

Disabilities.	Invalids sent to England from Cape and St. Helena.	Invalids Discharged the Service.	
		At the Cape.	At Netley.
Ague	..	..	4
Rheumatism	1	1	7
Syphilis	7	..	13
Scrofula, Phthisis, &c.	11	..	19
Anæmia	..	..	1
Diseases of the—			
Nervous System	12	1	9
Eye	8	1	8
Ear	1	1	1
Circulatory System	6	..	22
Respiratory „	2	..	4
Digestive „	5	1	10
Urinary „	1	1	..
Generative „	1	..	2
Locomotive „	2	..	1
Cutaneous „	3	1	6
General Debility	1	..	8
Delirium Tremens	..	1	..
Accidental Injuries	..	..	3
Self-inflicted „	..	..	1
Surgical operations	..	..	2
Total	61	8	121
Ratio per 1,000 of Mean Strength .. .. { 1869 ..	13·72	1·80	27·21
{ 1860-8	27·80	1·36	16·84

The number of invalids sent home was only one-third of that in 1868, and half the average of the last nine years. The reduction was chiefly in ophthalmia, rheumatism, syphilis, and diseases of the circulatory system. The numbers finally discharged the Service were considerably above the average. They included a number of cases of diseases of the circulatory system sent home in the preceding year; next to these scrofula and phthisis were the most frequent causes of discharge, but they differed little in amount from the numbers in previous years.

Section III.

Mean Daily Sick.

The mean daily sick at the Cape and St. Helena during the year was 229, or in the ratio of 51·49 per 1,000 of mean strength. The following Table gives the usual information deduced from these numbers :—

Cape of Good Hope and St. Helena.

	1869.	1860–68.
Ratio per 1,000 of Strength constantly Sick..	51·49	50·11
	days.	days.
Average Sick time to each Soldier	18·80	18·29
Average duration of cases of Sickness	16·37	19·14

The ratio constantly non-effective from sickness was considerably lower than in 1868, but slightly above the average of the last ten years. The mean sick time to each soldier was also slightly above, but the duration of the cases was two days and three-quarters under the average.

Section IV.

Influence of Age on the Mortality.

The following Table, framed from Abstract No. 20 in the Appendix, shows the ratio of mortality at each age, in quinquennial periods of life, among the corps which served at the Cape and St. Helena throughout the year :—

		Under 20.	20 and under 25.	25 and under 30.	30 and under 35.	35 and under 40.	40 and upwards.
Ratio of Deaths per 1,000 living ..	1869 ..	3·80	9·13	8·01	12·20	18·85	74·07
	1859–68	2·72	7·29	11·25	15·43	18·68	36·17

There has been an increase in the rate of mortality at 20 and under 25, and a decrease at the next two periods of life in the year under review. On the average of the preceding ten years the increase of mortality with the advance of age follows a regular progression, and the break which has been observed in many stations at the age of 30 and under 35 does not show itself here. The increase with the advance of age is only slightly in excess of what occurs among the troops serving at home. The numbers above 40 are too small to admit of any accurate deductions from them.

VIII.—ON THE HEALTH OF THE TROOPS SERVING IN THE ISLAND OF MAURITIUS.

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

Mauritius.

DURING the year the average strength of the garrison, which consisted of a detachment of Royal Artillery and Engineers and the Head-Quarters of the 86th Regiment, was 589; the admissions into hospital amounted to 1,211 and the deaths to 8, of which one occurred among the invalids sent to Netley. These numbers give the proportions of 2,056 admissions, and 13·59 deaths per 1,000 of mean strength, both much lower than in the preceding year. The admissions were still greatly above the average of the last ten years, but the deaths were 7 per 1,000 under it. The sickness affected all classes of troops alike, but there were no deaths in the Artillery or Engineers.

The influence of the different classes of diseases on the sickness and mortality is shown in the following Table, framed from Abstract No. 18 in the Appendix:—

Mauritius.

Order.	Diseases.	Strength 589.				1868.	
			Died.			Ratio per 1,000.	
		Admitted.	At Mauritius.	Of Invalids.	Total.	Admitted.	Died.
	I. *General Diseases.*						
1	Febrile Group ..	735	3	..	3	1247·9	5·09
2	Constitutional „ ..	80	..	1	1	135·8	1·70
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	6	..	..	..	10·2	..
2	Eye	9	..	..	..	15·3	..
3	Ear	4	..	..	..	6·8	..
5	Circulatory System ..	8	1	..	1	13·6	1·70
6	Absorbent „ ..	3	..	..	..	5·1	..
8	Respiratory „ ..	39	1	..	1	66·2	1·70
9	Digestive „ ..	161	1	..	1	273·3	1·70
10	Urinary „ ..	49	..	..	..	83·2	..
11	Generative „ ..	5	..	..	..	8·5	..
12	Organs of Locomotion ..	4	..	..	..	6·8	..
13	Cellular Tissue	12	..	..	..	20·4	..
14	Cutaneous System	38	..	..	..	64·5	..
	III. *Conditions, &c.*						
	Debility	1	..	..	..	1·7	..
	IV. *Poisons* ..	14	1	..	1	23·7	1·70
	V. *Injuries.*						
2	Accidental	43	..	..	..	73·0	..
	Total	1,211	7	1	8	2056·0	13·59
	Average of ten years, 1859–1868	..	..	..	..	1038·4	20·64

The admissions were nearly double, but the deaths were one-third less than, the average of the preceding ten years. The febrile group of general diseases furnished nearly two-thirds of all the admissions. The following Table shows the admissions and deaths by the principal affections in this class :—

General Diseases.	Admitted	Died.	Ratio per 1,000 of Mean Strength.			
			1869.		1859–68.	
			Admitted	Died.	Admitted	Died.
Febrile—						
Eruptive Fevers..	..	..	..	..	·3	..
Continued „	8	..	13·6	..	66·9	1·87
Paroxysmal „	720	2	1222·4	3·40	264·1	2·62
Malignant Cholera	..	..	..	..	9·9	3·73
Influenza..	4	..	6·8	..	1·0	..
Erysipelas	2	..	3·4	..	·9	..
Other Diseases of this Group ..	1	1	1·7	1·70	..	..
Constitutional—						
Rheumatism	20	..	33·9	..	26·4	..
Syphilis	35	..	59·4	..	56·0	..
Scrofula, Phthisis, &c.	10	1	17·0	1·70	9·0	2·10
Scurvy and Purpura	..	..	..	..	1·8	..
Anæmia	15	..	25·5	..	·7	..

Continued Fevers were greatly under the average This comparative exemption, however, was more than counterbalanced by the epidemic malarious fever, which was noticed in former reports as having begun towards the end of 1866, and has continued to prevail with more or less fluctuation ever since. In 1869 the admissions and deaths by it were much lower than in the preceding year, but the former were still more than four times the average of the preceding ten years. The disease was most prevalent in the first four months of the year; in May there was a marked reduction, which continued, with the exception of a slight increase in July and August, till the end of the year. The smallest number of cases occurred in June and December. There were 513 cases returned as ague, and 207 as remittent fever; of the former none, and of the latter two died. The proportion of cases was rather higher in the Artillery than in the Engineers and 86th Regiment, but the difference may probably have been a result of the small numbers of the former. The other diseases of this class differed but little from the average of the preceding ten years except that there were no cases of malignant cholera, and that there was a very large proportion of cases of anæmia; the latter were the result of repeated attacks of malarious fever. The admissions for scrofula and phthisis were above the average, but there was only one death from them—an invalid at Netley.

Of Local Diseases those of the *digestive system* were much the most prevalent, the ratio of admissions being nearly as high as by all the other groups. Dysentery and Diarrhœa constituted nearly one-fourth of the cases, but were not more prevalent than in 1868. Hepatitis was next in point of frequency and was more than twice as prevalent as in the preceding year; one case of it proved fatal. Diseases of the *urinary system* furnished 83 admissions per 1,000 of the strength, but the cases were mostly of gonorrhœa and gonorrhœal bubo.

Poisons.—Fourteen admissions were returned under this class, and one death. Eight, including the fatal case, were delirium tremens; the other six are supposed to have been such cases as were formerly returned as intemperance (*ebriositas*), and appear under the head of poisoning by alcohol.

There were no fatal accidents and no suicidal deaths during the year.

SANITARY REPORT.

Deputy Inspector-General Reid reports:—

All the Medical Officers who have had experience of the fever which has been epidemic during four successive hot seasons, agree in regard to its nature, and in respect of the many sources of malaria and of other morbific agencies

Mauritius. which exist in Mauritius, though happily diminished in intensity during the last two years. Unfortunately, the principal foci of malaria on the seaboard, in the lowlands, in and around the City of Port Louis, and other centres of the population do not admit of ready removal or diminution. The improvements through hurricanes and floodings and flushings, which were effected chiefly in 1868 and 1869, have been already referred to in my monthly summaries, wherein reference has also been made to the sanitary works which have been undertaken. These are by no means commensurate with the sanitary evils which exist. The succession of misfortunes which has come upon the island has greatly crippled the sources of its revenue.

Even before the outbreak of the principal fever epidemic, the great and increasing unhealthiness of Port Louis and most parts of the coast, where alone (except the little guard at Reduit) the troops are situate, had been remarked by some of my predecessors, and it had been several times represented. The abolition of most of the seaboard military posts, at least that of Port Louis, and the concentrating the major part of the force in the comparatively bracing and very salubrious plateau of Plaines Wilhems, whence the small garrison of the forts and prisons of Port Louis might be relieved monthly or weekly by rail, and the men's health and efficiency preserved, and their health standard raised even above that which they would show in England, has been so often urged as the truest economy of men and means, that it seems almost superfluous to revert to the subject.

Through the diminished strength of the station, the cubic space per man has been increased since 1868. From the gradual abatement of the virulence of the fever and its causes—the prolonged cool season of last year, the almost complete absence of the coast winds and indraughts from the seaboard during the hot season, now nearly at an end—the attacks have in general been milder, less frequent, attended with less exhaustion, and followed but rarely by organic change or dangerous sequelæ. The new cases which have occurred among soldiers who had escaped, and among new arrivals, have been after a considerable lapse of time. Whereas, in former years, exposure to the morbific agencies for a day, or a single night, was followed by a severe attack in thousands of instances. The new cases during this hot season have been few; many sailors have come and gone, after remaining weeks in harbour, and have not been attacked. In November and December 1867, when the experiment was tried to keep men in the Line Barracks into the hot season, it was regretted, for two-thirds of the force were soon prostrated.

During this hot season a company of the 86th were able to remain in the barracks almost entirely free from fever attacks till February, when the remit tent form became rather prevalent among them, and two fatal cases occurred, with morbid appearances as intense and as well-marked (the sallowness or yellowness of the skin and conjunctivæ excepted) as those of 1867—cerebral effusion, congestion, especially of the cerebral membranes and substance—enlargement of the liver, thick treacly bile, great enlargement of the spleen, and vascularity of the gastric mucous membrane,—were observed just as in 1867. But these men had often had fever before, though one of them had not had an attack for 11 months. Had they been newly arrived men, I think they would have suffered less.

All the troops remaining, though greatly improved in health, strength, and appearance, more or less need change; and I am pretty sure were the garrison entirely changed, the new comers would fare better, if landed here in June or July, than the present force during next hot season.

The sanitary works going on at the Caudan (referred to in recent reports) will be beneficial to the Line and Royal Artillery Barracks; but those projected at the Mer Rouge, and some general and effectual means of getting rid of excreta and house refuse without sending it into the harbour and its adjuncts, are of far greater importance, as they are of greater magnitude.

In the barracks of the station (Flacq, and Cannonière Point excepted) the charcoal system of latrines has been in use for a considerable time. It is effective, but very costly. The dry earth system does pretty well in the civil prisons; and an improved self-acting earth closet, tried this year in some civil hospitals and Government buildings, has answered admirably, and at less than half the cost of the charcoal closets or tubs.

The establishment of regimental canteens, with a supply of good and cheap groceries and drinks, is very much to be desired instead of the very objectionable contract canteen system.

In several communications I have pointed out the benefit which might result from a modified "Contagious Diseases Act" in this colony. It was proposed not to establish a separate hospital for the treatment of fallen women, but lock-wards in the civil hospital, to be managed by Sisters of Charity; to the expense of which wards, or rather of each patient treated therein, the War Department should contribute its quota. Lock-wards were opened on 25th December last; police notices, handbills, &c., were, I understand, freely used, and other means tried to induce females to come voluntarily to the civil hospital for the treatment of veneral disease; but up to this date not a single voluntary application of the kind has been made.

Section II.

On the Extent of Invaliding.

Only four invalids were sent from the Mauritius to England and two were finally discharged the Service at Netley, being in the ratio of 6·8 and 3·4 per 1,000 of the strength respectively. This, however, does not fairly represent the amount of invaliding due to the climate, as half a battery of Royal Artillery was in the middle of the year sent to the Cape of Good Hope on account of the great prevalence of fever among the men; these men though not actually sent as invalids were removed from the Island on account of the effects of malarious disease contracted there.

The average sent home during the preceding ten years was 42·76, and discharged the Service 16·92 per 1,000 of mean strength. Of those sent to England in 1869 one was invalided for secondary syphilis, one for dysentery, and two for debility, the result of malarious fever; and of those finally discharged, one was for diarrhœa, and one for synovitis.

Section III.

Mean Daily Sick.

The average number constantly non-effective from sickness during the year was 32·5, or in the ratio of 55·2 per 1,000 of mean strength, being a great reduction on the proportion in 1868, although above the average of the last ten years. The following Table gives the usual information on this subject as deduced from these numbers:—

	1869.	1859–68.
Ratio per 1,000 of Strength constantly Sick	55·20	45·27
	Days.	Days.
Mean Sick-Time to each Soldier	20·15	16·52
Average duration of cases of Disease	9·80	15·91

Compared with the results for 1868, there has been a marked reduction in all the points comprised in this table. The mean daily sick has, however, been 10 per 1,000 above the average of the last ten years, and the mean sick time to each soldier serving has been three and a half days above the average, but the duration of the cases has been six days under the average.

Section IV.

Influence of Age on the Mortality.

Mauritius. The following Table shows the strength and deaths at each age, in quinquennial periods of life, of the troops serving in the Mauritius during the year :—

Corps.	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
Royal Artillery	2	...	21	...	22	...	10	...	8	...	2	...
„ Engineers	1	...	4	...	7	...	7	...	1	...	2	...
86th Foot	47	...	245	1	182	3	99	2	45	...	...	...
Total	50	...	270	1	211	3	116	2	54	...	4	..
Ratio per 1,000 of Strength { 1869	...		3·70		14·21		17·24		...		...	
{ 1859-68 ...	8·68		15·72		16·67		24·42		32·74		47·62	

This Table shows a considerable increase in the rate of mortality with the advance of age, but with a break in the progressive increase at the ages 25 and under 30, on the average of the preceding 10 years. This does not appear to have been a result of the epidemic, as it was quite as marked in the seven years preceding the first outbreak of the fever in the island. In the year under review the break in the progression was at the ages 30 and under 35, but the numbers under observation were limited.

IX.—ON THE HEALTH OF THE TROOPS SERVING IN THE ISLAND OF CEYLON

Section I.

Sickness and Mortality.

STATISTICAL REPORT.

1.—WHITE TROOPS.

Ceylon.

THE left wing of the 73rd Regiment arrived in Ceylon from China in the middle of January and the Head-Quarters in the middle of March, relieving the 59th Regiment, which proceeded to Bombay. The average strength of the European troops during the year was 906; the admissions into hospital were 1,353, and the deaths 27, including 5 among invalids on their passage to England. These numbers give the ratio of 1,493 admissions and 29·80 deaths per 1,000 of mean strength, both being higher than in the preceding year.

The following Table, framed from Abstract No. 18 in the Appendix, shows the amount of sickness and mortality caused by each of the different classes of diseases :—

Ceylon.

Orders.	White Troops .. .. .. Diseases.	Strength, 906. Admitted.	Died. At Ceylon.	Died. Of Invalids.	Died. Total	Annual Ratio per 1,000. 1869. Admitted.	1869. Died.
	I. *General Diseases.*						
1	Febrile Group	246	3	..	3	271·5	3·31
2	Constitutional „	125	3	3	6	138·0	6·63
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous system	6	2	..	2	6·6	2·21
2	Eye	45	..	..	..	49·7	..
3	Ear	19	..	..	..	21·0	..
5	Circulatory system	16	2	..	2	17·6	2·21
6	Absorbent „	28	..	..	..	30·9	..
8	Respiratory „	52	..	1	1	57·4	1·10
9	Digestive „	344	7	..	7	379·7	7·73
10	Urinary „	72	1	..	1	79·5	1·10
11	Generative „	32	..	..	..	35·3	..
12	Organs of Locomotion	8	..	..	..	8·8	..
13	Cellular Tissue	25	..	..	..	27·6	..
14	Cutaneous system	156	..	1	1	172·2	1·10
	III. *Conditions, &c.*						
	Debility	3	..	..	..	3·3	..
	IV. *Poisons*	46	1	..	1	50·8	1·10
	V. *Injuries.*						
2	Accidental	124	2	..	2	136·9	2·21
4	Self-inflicted	..	1	..	1	..	1·10
	No appreciable disease	6	..	..	..	6·6	..
	Total	1,353	22	5	27	1493·4	29·80
	Average of 10 years, 1859–68..	..	..	..	..	1445·5	24·29

General Diseases furnished two-sevenths of all the admissions ; two-thirds of the cases were of the febrile, and one-third of the constitutional group. The following Table shows the prevalence of the principal diseases in this class :—

General Diseases.	Admitted	Died.	Ratio per 1,000 of Mean Strength.			
			1869.		1859–68.	
			Admitted	Died.	Admitted	Died.
Febrile—						
Eruptive Fevers	..	..	..	..	·6	·11
Continued „	45	2	49·7	2·21	69·2	1·01
Paroxysmal „	199	1	219·7	1·10	115·5	1·69
Malignant Cholera	..	..	..	..	4·3	2·15
Influenza..	2	..	2·2	..	·8	..
Erysipelas	..	..	..	..	1·1	..
Constitutional—						
Rheumatism	18	..	19·9	..	53·5	·11
Syphilis	64	..	70·6	..	90·9	..
Scrofula, Phthisis, &c.	27	5	29·8	5·52	17·4	2·81
Scurvy and Purpura	1	..	1·1	..	2·2	..
Anæmia	8	..	8·8	..	4·3	..
Other Diseases	7	1	7·7	1·10	..	..

Continued Fevers, though more prevalent than in 1868, were considerably under the average of the last ten years, but *paroxysmal fevers* were more than double the average. This great excess was attributed by the Medical Officers to the circumstance of the garrison having consisted chiefly of the 73rd Regiment, which arrived in the beginning of the year from Hong Kong where the men had contracted a susceptibility to ague. No cases of malignant cholera occurred during the year.

Rheumatism and *Syphilis* were under the average. *Scrofula* and *Phthisis* were much above the average in both the admissions and the deaths. The excess of cases occurred in the 73rd Regiment. Hereditary predisposition and syphilis are assigned by the Medical Officer in charge as the exciting causes of phthisis in this corps.

Local Diseases.—Those of the *digestive system* were much the most prevalent, the admissions by them amounting to 380 per 1,000 of the strength, and the deaths to 7·73, or more than half the total mortality by local diseases. Dysentery and diarrhœa were more prevalent, though less fatal, than in the preceding year. Hepatitis was the chief cause of mortality in this class. It is probable that the prevalence of these diseases was affected by the previous service of the 73rd Regiment in China.

Ophthalmia was slightly higher than in 1868, but was under the average. *Diseases of the Cutaneous System* were slightly above the average, chiefly from the prevalence of ulcers in the 73rd Regiment. These are stated by the Medical Officer to have been due to the irritation caused by mosquito bites amongst men lately arrived in the island.

Poisons.—Thirty-two cases of *delirium tremens*, and 14 of alcoholic poisoning, appear in the Returns. It is presumed that the latter were such cases as, under the old nomenclature, would have been returned under the head of intemperance (*ebriositas*). One of them died—a private of the 73rd Regiment, at Newera Ellia—but no details are given of the case.

The admissions from Accidental Injuries differed little from the average of preceding years. Two deaths were recorded under this class, one from severe contusion, with laceration of the axillary artery, and the other by drowning. There was also one suicidal death by drowning.

2. Black Troops.

The average strength of the Asiatic troops during the year was 943, among whom 477 admissions into hospital and 10 deaths occurred, being respectively in the ratio of 506 and 10·60 per 1,000 of mean strength. The admissions

Ceylon. were slightly higher, but the deaths one-half lower than in 1868, and both were under the average of the last ten years.

The influence of the different classes of diseases in causing this amount of sickness and mortality is shown in the following Table, framed from Abstract No. 18 in the Appendix.

Orders.	Black Troops .. .. Diseases.	Strength 943. Admitted	Died.	Annual Ratio per 1,000 of Mean Strength. 1869. Admitted.	Died.
	I. *General Diseases.*				
1	Febrile Group	110	1	116·7	1·06
2	Constitutional „	47	2	49·8	2·12
	II. *Local Diseases.*				
	Diseases of the—				
1	Nervous System	4	1	4·2	1·06
2	Eye	48	..	50·9	..
3	Ear	1	..	1·1	..
5	Circulatory System	5	1	5·3	1·06
6	Absorbent „	6	..	6·4	..
8	Respiratory „	42	4	44·5	4·24
9	Digestive „	42	..	44·5	..
10	Urinary „	29	..	30·7	..
11	Generative „	11	..	11·7	..
12	Organs of Locomotion	2	..	2·1	..
13	Cellular Tissue	18	..	19·1	..
14	Cutaneous System	84	1	89·1	1·06
	V. *Injuries.*				
2	Accidental	28	..	29·7	..
	Total	477	10	505·8	10·60
	Average of 10 years, 1859–68	..	..	1012·8	14·82

GENERAL DISEASES were the cause of one-third of the admissions and nearly one-third of the deaths. The following Table shows the prevalence of the principal diseases comprised in this class:—

Diseases.	Admitted.	Died.	Ratio per 1,000 of Mean Strength. 1869. Admitted.	Died.	1859–68. Admitted.	Died.
Febrile—						
Eruptive Fevers	9	..	9·5	..	8·9	·07
Continued „	..	..	..	..	27·8	·22
Paroxysmal „	99	1	104·9	1·06	376·3	1·70
Malignant Cholera	..	..	..	..	7·4	3·71
Influenza	..	..	..	..	·2	..
Erysipelas	1	..	1·1	..	1·0	..
Other Diseases	1	..	1·1	..	..	..
Constitutional—						
Rheumatism	27	..	28·6	..	50·5	..
Syphilis	16	..	17·0	..	7·1	..
Scrofula, Phthisis, &c. ..	4	2	4·2	2·12	2·8	1·33
Anæmia	..	..	..	..	1·3	..

Eruptive Fevers furnished 9 admissions—two of smallpox at Kandy, modified by previous vaccination, and 7 of chicken-pox. There were no cases of continued fever, and paroxysmal fevers were much less frequent than in 1868, and greatly below the average.

No cases of *malignant cholera* were admitted during the year. The admissions by *rheumatism* differed very slightly from 1868, but were considerably under the average. Those by *syphilis* amounted only to 17 per 1,000 of the strength, being scarcely one-fourth of the proportion among the white troops, a result which has been frequently noticed as being a consequence of the large proportion of men in the Ceylon Rifles married, or living in concubinage.

Local Diseases.—Those of the eye furnished a very high proportion of admissions from the prevalence of conjunctivitis and tarsal ophthalmia. The ratio was nearly one-half higher than that from ophthalmia in 1868, but was considerably under the average of the last ten years. Diseases of the respiratory system were rather less prevalent than formerly, but they were the cause of a high ratio of mortality.

Dysentery and diarrhœa constituted upwards of half the admissions by diseases of the digestive system, but the proportion of cases was slightly lower than in 1868, and none of the cases terminated fatally.

Diseases of the integumentary system furnished the highest ratio of cases of all the groups of local diseases, chiefly from the prevalence of ulcers, but itch also contributed to swell the amount, 19 cases having been admitted under that head.

Accidental injuries were slightly in excess of the proportion in 1868, but greatly under the average. There were no violent deaths during the year among this class of troops.

SANITARY REPORT.

Surgeon Roe, Ceylon Rifles, Acting Principal Medical Officer, reports:—

"The health of the troops in this Command during the past year may be regarded as satisfactory, although it contrasts, in some respects, with that of the preceding year. Notwithstanding that the mortality was exactly the same in 1868 as in 1869, the European force, which was remarkably healthy in the former year, was by no means so in the latter, and the native troops, who suffered rather severely in 1868, enjoyed excellent health in 1869. The considerable mortality which occurred amongst the European troops in 1869 is attributed by Surgeon Ferguson, 73rd Regiment, (in whose corps the greater number of deaths occurred) to—

"1st. That before their arrival most of the men had been exposed for two years to the debilitating effects of a Hong Kong climate.

"2nd. They were sent on here without getting a tour in Japan, the salubrious climate of which would have, in my opinion, so improved their general health, as to enable them much better to withstand this.

"3rd. That they arrived here at the hottest and most unhealthy season of the year.

"4th. That the barrack accommodation is very indifferent."

In these views I entirely coincide, and would add to them:—

1st. An extremely oppressive and prolonged hot season immediately followed by unprecedentedly heavy and long-continued rains, a concatenation admirably adapted to develope and mature those dysenteric and hepatic diseases which proved so fatal.

2nd. The departure from the Command of the 59th Regiment, the men of which Corps were in a measure acclimatised, and the arrival from Australia of the 2nd Brigade Royal Artillery, the men of which had not previously served in the tropics.

3rd. The arrival of the 73rd Regiment from China,—a move from one tropical station to another generally (as in this instance) resulting in much sickness and mortality.

Ceylon. The healthy condition of the Native troops during the year I deem to be almost entirely due to the great care that was taken to enlist no recruits but those who were likely to make strong, healthy, and efficient soldiers, whilst all feeble and sickly old men (of whom there were a considerable number in the two Native Corps) were discharged as invalids, or had their services dispensed with on the recent reduction of the Ceylon Rifle Regiment.

The clothing with which the troops are supplied is, on the whole, suitable, with the exception of the dark serge dress of the Ceylon Rifle Regiment. The material of which this clothing is made is too heavy and coarse, and the European fashion of the garments (particularly of the trowsers) is not at all in accordance with Oriental ideas of ease and comfort. The result is that the men resume their native dress the moment they are relieved from duty, and this sudden change of hot woollen clothing for light and loose cotton garments cannot be otherwise than prejudicial to health.

The rations supplied to the troops at the different stations in this Command are not very good, the meat ration, as a rule, consisting of tough and very lean beef, which is never changed for any other animal food. It is in quality unpalatable and innutrious, and its daily use makes it monotonous and distasteful. These remarks apply particularly to Newera Ellia, where the soldiers have not the opportunity of supplementing their rations with other articles of food and condiments, which, in the low country stations, they purchase with their private means. As the men complained to me at a recent inspection which I made of that station, I represented the matter to the Major-General Commanding, and recommended that salt meat be issued twice a week to the detachments stationed there, but found on reference to W. O. Letter, 12th May, 1868, that the issue of salt meat in this Command was interdicted.

The water supply at nearly all the stations in the Command is fairly good, and no steps have been taken to increase the available quantity, or, by filtration or other means, to improve its quality. During the year civilians, at almost every station in the island, introduced Norton's tube wells, and, as far as I can ascertain, with very satisfactory results. These appliances have been the means of affording an abundant supply of water which was free from the suspicion of being contaminated with sewage or other impurities; and their introduction for the use of the troops would be desirable.

The latrines, urinals, and ablution rooms are, at the majority of the stations, rather unsatisfactory. The dry earth system has been introduced at Kandy, Newera Ellia, and for the native troops at Colombo. At the latter station this apparatus is supposed to be self-acting, but it very frequently gets out of order, and as native soldiers always like to use water, it is unpopular, and not so suitable for them as Jennings' or Macfarlane's systems. For European troops it answers admirably, but a *reliable* self-acting arrangement has not, I believe, been yet devised.

During the year, some of the barracks and hospitals underwent slight repairs and alterations, but no buildings were erected or any sanitary work of importance undertaken.

Preparations are being made for raising the old Dutch fortifications which defend Colombo on the land side, and this important work, when completed, will render available a considerable space of ground, which, if for sale, would be eagerly purchased by merchants, shopkeepers, and other members of the mercantile community, whose business operations have hitherto been cramped by the narrow limits of the fort.

I have, however, heard with regret, that it has been almost definitely arranged to erect, on the site of the fortifications now about to be levelled, barracks which will accommodate the major part of the European troops in the Command, and that the valuable ground, which will be reclaimed by the filling-in of the fort ditch, will be converted into an esplanade or parade ground.

As sites suitable for barracks are available in the hilly districts of the central province, where, at an elavation of from 5,000 to 7,000 feet above sea level, the climate would bear favourable comparison with that of the health resorts of Europe, the building of new barracks at Colombo for European troops would, in a sanitary point of view, be injudicious; and I think that if

the question be considered financially and strategically, the same conclusion would be arrived at. *Ceylon.*

Looking at its financial aspect, it appears to me that the large sum, which the sale of the valuable land reclaimed by the demolition of the Colombo fortifications would realise, would not only purchase any site that might be deemed most suitable in the central province, but would go far towards erecting the necessary barrack accommodation thereon, or, as it is almost certain that excellent sites would, on examination, be found on the Crown reserves of the central province, the whole of the money could be devoted to building.

In a strategical point of view, the mountain fastnesses of the central province should command and control the low-lying maritime districts, and, with the railway communication now available and projected,—the traction engines and wire tramways now being introduced,—the most remote districts of the central province will, at no distant period, be brought within a few hours easy travel of Colombo.

It is not, however, the financial or strategical bearings of the subject with which I have to deal. Strictly speaking I should confine my remarks to its consideration as a sanitary measure, and here no difference of opinion exists, for all who know Ceylon are unanimous in declaring that the salubrity of some of the hilly districts of the central province is all that can be desired. So convinced am I of the soundness of this opinion, that I have no hesitation in recording my belief that if European troops, on their arrival in Ceylon, were sent direct to barracks situated in a healthy and elevated district, and only in small detachments, and for short periods sent to the plains, the present rates of sickness, mortality, and invaliding, would at once undergo a diminution of at least 50 per cent.

I have recently returned from a trip to the interior of the Island, during which I was much struck with the suitableness of a plateau called Horton Plains, as a site for barracks. This famed spot is situated in the central province, in latitude 6° 48′ N., and longitude 80° 40′ E., and is distant about 18 miles from Newera Ellia, and 30 miles from Ratuapsora, with both of which places it is connected by a bridle road.

During my sojourn there I made a most complete inspection of the entire locality, and was convinced that in every respect it would be a most eligible site on which to erect barracks for European troops. Its elevation is about 7,000 feet above the sea level, and its climate is in many respects similar to, but cooler, drier, fresher, and more bracing than that of Newera Ellia, which latter station labours under the disadvantage of being 800 feet lower, and is in situation a valley or gorge, which during the greater part of the year is little better than a swamp, whereas Horton Plains consist of several low, dry, undulating ridges or plateaus, which are separated by large permanent streams, and belts of timber-bearing forest trees, and which, while free from swamp or marsh, are in no direction shut in by hills.

I would therefore suggest that the new barracks for European troops be erected on this very eligible site; and as the whole of the district is Crown reserve, and excellent timber, and other building materials are procurable on the spot, I submit that most comfortable barracks could there be erected for a comparatively small sum, particularly if the European troops for whom the barracks are intended were encamped in the locality, and employed on the buildings, roads, &c., &c.

Of the many excellent sites for new barracks available, my opinion, based on a lengthened residence in Ceylon, and previous charge of an Indian Sanitarium, is that it would be difficult to find, in the tropics, one which presents so many advantages as that of Horton Plains, and it is gratifying to me to think that Dr. Parkes has, in his excellent book on "Practical Hygiene," expressed a very similar opinion.*

"There is an ordinance in force for the prevention of contagious diseases,

* It may be well to observe that the attention of the Principal Medical Officer has been directed to this subject, and that he has been called upon to make a very careful sanitary inspection of the locality, with a view to reporting on its suitability to meet all the requirements of the troops.

Ceylon. very similar to that in England. No special arrangements have been made for nightly private ablution; but there is every facility for that purpose. The Native troops enjoy an immunity from contagious diseases, as many of the men are married."

Section II.

On the Extent of Invaliding.

During the year there were 39 invalids of the European Force sent to England, and 14 finally discharged the Service at Netley, and there were 24 of the Asiatic troops discharged as invalids in Ceylon. These numbers give the ratio of 43·05 sent home, and 15·45 discharged per 1,000 of the European, and 25·44 discharged per 1,000 of the Asiatic troops. These results are slightly in excess of those for 1868 but considerably under the average as regards the European troops, while they are under those for 1868 but above the average in the Asiatic Force.

The disabilities for which the men were invalided and discharged are detailed in Abstract No. 19 in the Appendix, from which the following classified summary has been made:—

	European Troops.		Asiatic Troops.
	Invalids sent to England.	Invalids Discharged at Netley.	Discharged as Invalids in Ceylon.
Ague	1	..	1
Syphilis	2	2	..
Phthisis	12	3	..
Anæmia	..	2	..
Lupus	1	..	..
Diseases of the—			
Nervous System	..	3	..
Eye	1	..	4
Circulatory System	4	1	1
Digestive „	15	1	..
Urinary „	1	..	..
Cutaneous „	..	1	..
Debility	..	..	18
Accidental Injuries	2	..	..
Surgical Operations	..	1	..
Total.. ..	39	14	24
Ratio per 1,000 of Mean Strength { 1869 ..	43·05	15·45	25·44
{ 1860-68 ..	51·02	22·33	16·01

Phthisis, hepatitis, dysentery, and diarrhœa were the chief disabilities among the invalids sent to England. Of the Asiatic troops, 18 were discharged for debility. The Medical Officers give no specific information regarding these cases, but as they were all men over 35 years of age, and 13 of them were over 40, it is probable they were discharged under that head as being no longer equal to the active duties of a soldier.

Section III.

Mean Daily Sick.

Ceylon.

The average numbers constantly non-effective from sickness were 53 of the European and 23 of the Asiatic Force, being respectively in the ratio of 58·50 and 24·39 per 1,000 of mean strength. The usual information on this head, deduced from these numbers, is given in the following Table :—

	White Troops.		Black Troops.	
	1869.	1859–68.	1869.	1859–68.
Ratio per 1,000 of Strength constantly sick	58·50	67·71	24·39	33·05
	days.	days.	days.	days.
Average sick time to each Soldier	21·35	24·71	8·90	12·06
Average duration of cases of Sickness ..	14·30	17·10	17·60	11·91

Compared with the results for 1868 there has been an increase among both white and black troops in all those particulars except the duration of the cases among the white troops, which has decreased a day and a-half. This Table shows the mean daily sick and the average sick time to each soldier to have been considerably under the average of the preceding ten years ; the duration of the cases, also, among the white troops has undergone a reduction of nearly three days, but among the black troops it has increased six days and a-half. The marked reduction in the admissions into hospital of the latter class, which was shown in the preceding part of the Report, has, therefore, taken place chiefly in those cases which required a very short period of detention in hospital.

Section IV.

On the Influence of Age on the Mortality.

The ages of the white troops serving in Ceylon, and the deaths at each age, in quinquennial periods, are shown in the following Table; the Returns of the Ceylon Rifles are not available :—

White Troops.	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.	
Corps.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
Royal Artillery	6	...	25	1	42	2	50	2	25	1	1	...
73rd Foot	46	...	205	3	179	9	98	2	12	1	1	...
Total	52	...	230	4	221	11	148	4	37	2	2	...
Ratio per 1,000 of strength { 1869	...		13·39		49·77		29·73		54·05		...	
{ 1860-68 ...	8·14		16·17		27·79		32·55		53·00		76·92	

This Table shows a very rapid increase of mortality with the advance of age ; much more rapid than in temperate climates, but with the same break at the age 30 and under 35 which has been shown in most of the other colonies, and which we have considered to be a result of the operation of the Limited Enlistment Act.

X.—ON THE HEALTH OF THE TROOPS IN THE AUSTRALASIAN COLONIES.

Section I.

Sickness and Mortality.

I. Australia and Tasmania.

STATISTICAL REPORT.

Australia. In the end of March the 50th Regiment embarked for England; during the remainder of the year the troops employed consisted of the 1st Battery 1st Brigade Royal Artillery, and the 2nd Battalion 14th Regiment. The average strength of the troops during the year was 1,072; the admissions into hospital were 753, and the deaths 7, being in the ratio of 702 and 6·52 per 1,000 of mean strength, the former slightly above, and the latter only one half, the proportion in the preceding year.

The following Table, framed from Abstract No. 21 in the Appendix, shows the classes of diseases by which the admissions and deaths were caused:—

Average Strength .. .. 1,072.		Australia and Tasmania. 1869.					
			Died.			Ratio per 1,000.	
Orders.	Classes of Diseases.	Admitted.	In the Colony.	Of Invalids.	Total Deaths.	Admitted.	Died.
1	I. *General Diseases.*						
2	Febrile Group	26	1	..	1	24·3	·93
	Constitutional „	172	3	..	3	160·5	2·80
	II. *Local Diseases.* Diseases of the—						
1	Nervous System	13	..	..	..	12·1	..
2	Eye	32	..	..	..	29·8	..
3	Ear	1	..	..	..	·9	..
5	Circulatory System	6	1	..	1	5·6	·93
6	Absorbent „	11	..	..	..	10·3	..
8	Respiratory „	34	..	..	..	31·7	..
9	Digestive „	65	..	..	..	60·6	..
10	Urinary „	164	1	..	1	153·0	·93
11	Generative „	13	..	..	..	12·1	..
13	Cellular Tissue	7	..	..	..	6·5	..
14	Cutaneous System	54	..	..	..	50·4	..
	IV. *Poisons*	7	1	..	1	6·5	·93
	V. *Injuries.*						
2	Accidental	143	..	..	..	133·4	..
3	Homicidal	2	..	..	..	1·9	..
	No appreciable Disease ..	3	..	..	..	2·8	..
	Total	753	7	..	7	702·4	6·52
	Average of 10 years, 1859–68..	..	..	..	..	707·7	13 41

The admissions by GENERAL DISEASES amounted to a little more than one fourth of the whole, and the proportion of cases of the febrile group was very small. The following Table shows the admissions and deaths by the principal diseases in this class :—

Australia.

General Diseases.	Admitted.	Died.	Annual Ratio per 1,000 of Strength. 1869. Admitted.	1869. Died.	1859-68. Admitted.	1859-68. Died.
Febrile—						
Eruptive Fevers	..	..	..	..	1·1	·10
Continued ,, ...	23	1	21·4	·93	18·2	·78
Paroxysmal ,, ...	3	..	2·8	..	4·6	·10
Influenza	..	..	..	..	19·7	..
Erysipelas	..	..	..	..	1·2	..
Constitutional—						
Rheumatism	24	..	22·4	..	37·3	..
Syphilis	136	..	126·9	..	43·8	..
Scrofula, Phthisis, &c. ..	11	3	10·2	2·80	15·2	4·80
Scurvy and Purpura . ..	1	..	·9	..	·6	..

The diseases in the febrile group differ very little from the average of the preceding ten years, except in the absence of influenza in 1869. An almost complete immunity from paroxysmal fevers and a very small proportion of those of the continued type appear to be striking features in this Command. In the constitutional group of general diseases, rheumatism and phthisis show a decrease, but syphilis a very great increase. The excess occurred in the 2nd Battalion 14th Regiment, the proportion in the Royal Artillery being very low. It was not confined to any particular station, but the ratio of admissions was higher in Tasmania than in New South Wales or Victoria, and the proportion of cases of secondary syphilis was greater.

Local Diseases.—Those of the *urinary system* furnished the highest number of admissions, owing to the prevalence of gonorrhœa and its consequences which are included in this class. In the class of diseases of the digestive system tonsillitis and dyspepsia, in those of the respiratory system bronchitis, and in those of the cutaneous system boils and ulcers, were the most prevalent affections. *Ophthalmia* was rather more prevalent than in 1868, though under the average of the last ten years.

Accidental Injuries gave rise to a high proportion of admissions, but none of them proved fatal. There were no deaths by suicide during the year.

SANITARY REPORT.

Deputy Inspector-General Ewing reports that the troops in this Command had been healthy. The relative prevalence of venereal, compared with other diseases, was large, more than one-third of the admissions during the year having been from this source.

In the Report for 1868, the subject of intemperance was mentioned as a source from which the number of admissions was swollen. For this year the number of admissions amounted to 80, chiefly accidents, and generally of trifling character; but including seven cases of delirium tremens. The gravest aspect of this subject is the injury it entails on general health, in sowing the seeds of serious chronic diseases, and predisposing to attacks of an acute nature.

The sanitary condition of the barracks and hospitals at all the stations is tolerably good, and the cubic space and superficial area have not been less, but generally more than the Regulations of the Service point out. This has arisen from the decrease of the force, caused by the withdrawal of one battalion (the 50th Regiment) from the Command. The ventilation of the buildings is also tolerably satisfactory, as are also the means of ablution. No change had taken place during the year in the cooking arrangements, and

none was called for, and there has been no alteration in the quantity or quality of the soldiers' diet, of which there has been nothing to complain. The clothing of the men was suitable to the climate, and it underwent no change. The vicinities of the various stations are healthy, except that of the Victoria Barracks, Melbourne, where there is an objectionable swamp, and previous operations for its drainage have not been very successful. There has been no improvement during the year in the sanitary condition of Melbourne, which city is within the distance of a mile from the barracks. *Australia.*

There is no Act of Parliament, Local Ordinance, or Law, in existence, in any of the Australian Colonies, for the prevention of venereal disease, and no special arrangements or facilities exist for the private ablutions of the men.

II. New Zealand.

STATISTICAL REPORT.

The average strength of the troops in New Zealand during the year was 701, among whom there were 580 admissions into hospital, and 4 deaths, being in the ratio of 827 and 5·72 per 1,000 of strength, the former considerably above, and the latter below, the proportion in the preceding year. *New Zealand.*

The diseases by which the admissions and deaths were caused are detailed in Abstract No. 21 in the Appendix, from which the following Table has been framed :—

Orders.	Average Strength .. .. 701.	Admissions.	Deaths.	Ratio per 1,000 of Mean Strength. 1869. Admitted.	Died.
	Diseases.				
	I. *General Diseases.*				
1	Febrile Group	35	..	49·9	..
2	Constitutional „	68	1	97·0	1·43
	II. *Local Diseases.*				
	Diseases of the —				
1	Nervous System	35	1	49·9	1·43
2	Eye..	39	..	55·6	..
3	Ear..	7	..	10·0	..
5	Circulatory System	14	1	20·0	1·43
8	Respiratory „	67	..	95·6	..
9	Digestive „	116	..	165·5	..
10	Urinary „	21	..	30·0	..
11	Generative „	4	..	5·7	..
12	Organs of Locomotion	2	..	2·8	..
13	Cellular Tissue	6	..	8·5	..
14	Cutaneous System	60	..	85·6	..
	IV. *Poisons*	12	..	17·1	..
	V. *Injuries.*				
2	Accidental	93	1	132·7	1·43
	No appreciable Disease	1	..	1·4	..
	Total	580	4	827·3	5·72
	Average of ten years, 1859-68	..	..	588·1	16·09

New Zealand. The admissions in 1869 were much higher, but the deaths much lower, than the average of the preceding ten years. The difference, however, in the situation of the troops—in garrison during the whole of the last year, and on field service during a considerable portion of the previous period—renders the comparison of little value.

General Diseases caused little more than a seventh of all the admissions; about one-third of them were of the febrile, and two-thirds of the constitutional group. The following Table shows the influence of the principal diseases of this class:—

General Diseases.	Admitted.	Died.	Annual Ratio per 1,000 of Strength. 1869. Admitted.	1869. Died.	1859–68. Admitted.	1859–68. Died.
Febrile—						
Eruptive Fevers	1	..	1·4	..	·1	·02
Continued „	10	..	14·3	..	31·6	1·02
Paroxysmal „	..	..	..	..	3·9	·07
Influenza	23	..	32·8	..	14·1	..
Erysipelas	1	..	1·4	..	1·4	..
Constitutional—						
Rheumatism	39	..	55·6	..	30·8	..
Syphilis	17	..	24·3	..	11·0	·02
Scrofula, Phthisis, &c. ..	11	1	15·7	1·43	8·0	1·80
Scurvy and Purpura	..	..	..	..	·3	..
Anæmia	1	..	1·4	..	1·4	·2

Continued Fevers were considerably under the average, and were even lower than in Australia.

Influenza furnished more than double the average proportion of admissions, but it does not seem to have prevailed as an epidemic.

Syphilis, as might be anticipated from the return of the troops into quarters, was much above the average of the preceding years, but it was very much less prevalent than in Australia.

Local Diseases.—Those of the *digestive system* were the most prevalent, the excess being chiefly due to a large number of cases of dyspepsia, probably a result of intemperance. There were no cases of dysentery, and only 10 of diarrhœa. Eleven admissions from hepatitis were recorded, but no information is given in the Reports relative to their cause.

Diseases of the Eyes were very prevalent, but the ratio of admissions was lower than in 1868, though still above the average. Many of the cases were relapses in men who had suffered from ophthalmia previously.

Accidental Injuries were considerably above the average, but there was only one death from drowning. There were no suicidal deaths during the year.

Section II.

On the Extent of Invaliding.

Australasia. There were 33 invalids sent to England during the year from Australasia. One man was discharged by invaliding in the colony, and 21 at Netley. These numbers give the proportion of 18·61 invalids sent home, and 12·41 discharged, per 1,000 of mean strength. The following Table, framed from Abstract No. 22 in the Appendix, shows the classes of disabilities for which the men were invalided:—

Australasia.

Mean Annual Strength, 1,773. Classes of Disabilities.	Invalids sent to England from Australasia.	Invalids Discharged the Service. In Australasia.	Invalids Discharged the Service. In England.
Ague	..	..	1
Rheumatism	..	..	1
Scrofula and Phthisis	7	..	1
Diseases of the—			
Nervous System	5	..	4
Eye	6	..	5
Ear	1	..	..
Circulatory System	8	1	5
Organs of Locomotion	..	..	1
Debility	..	..	3
Accidental Injuries	6	..	..
Total	33	1	21
Ratio per 1,000 of Mean Strength 1869	18·61	·56	11·85
Ratio per 1,000 of Mean Strength 1861–8	20·74	3·41	13·95

The invaliding has been under the average of the preceding ten years. Diseases of the circulatory system caused the largest amount of invaliding, but half of the cases sent home were varicose veins, none of which were finally discharged. Diseases of the eye were the cause of nearly one-fourth of the discharges; three were discharged for ophthalmia, one for cataract, and one for short sight.

Section III.

Mean Daily Sick.

The average number constantly sick during the year was 41 in Australia, and 28 in New Zealand, being respectively in the ratio of 38·25 and 39·94 per 1,000 of mean strength, both higher than in 1868.

The following Table gives the usual information on this head, calculated from these numbers :—

	Australia and Tasmania.		New Zealand.	
	1869.	1859–68.	1869.	1860–8.
Ratio per 1,000 constantly sick	38·25	33·66	39·94	34·51
	days.	days.	days.	days.
Average sick time to each soldier	13·96	12·29	14·58	12·60
Average duration of cases	19·87	17·36	17·62	21·46

The proportion constantly sick, and the average sick time to each soldier, have been higher than in the preceding period. There has been an increase also in the duration of the cases in Australia, but a decrease in New Zealand.

Section IV.

On the Influence of Age on the Mortality.

Australasia. The following Table shows the ages of the troops serving during the year in Australasia, and the deaths at each age in quinquennial periods of life :—

Corps.	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
Royal Artillery	2	...	19	...	47	..	20	1	10	...	5	...
2nd Battalion 14th Foot... ...	9	...	8	...	471	...	201	1	73	1	6	1
2nd ,, 18th ,, ...	5	...	46	...	439	2	199	1	63	1	8	...
Total	16	...	73	...	957	2	420	3	146	2	19	1
Ratio per 1,000 of Strength ... { 1869 ...	...		...		2·09		7·04		13·70		52·63	
Ratio per 1,000 of Strength ... { 1859-68 ...	6·26		11·94		15·48		15·67		24·63		42·32	

This Table shows a progressive increase in the rate of mortality with the advance of age, but with a break in the progression at the age of 30 and under 35, probably resulting from the operation of the "Limited Enlistment Act."

XI.—ON THE HEALTH OF THE TROOPS SERVING IN CHINA AND JAPAN.

Section I.

Sickness and Mortality.

I. China.

STATISTICAL REPORT.

1. White Troops.

China.

In the end of February the left wing of the 75th Regiment embarked for Singapore. After that date the European garrison consisted of a battery of Royal Artillery, a small detachment of Royal Engineers, and the right wing of the 75th Regiment. The average strength of this class of troops was 577 men, among whom there occurred 662 admissions into hospital, and 11 deaths, inclusive of 6 among invalids sent to England. These numbers give the ratio of 1,147 admissions and 19·06 deaths per 1,000 of mean strength, both somewhat higher than in 1868, but very much under the average of the last ten years.

The diseases by which the sickness and mortality were caused are detailed in Abstract No. 21 in the Appendix, from which the following classified summary has been framed :—

China.

Order.	Diseases.	Admitted.	Died. In China.	Died. Of Invalids.	Died. Total.	Ratio per 1,000. 1869. Admitted.	Ratio per 1,000. 1869. Died.
	Strength	577.					
	I. *General Diseases.*						
1	Febrile Group	149	..	..	..	258·2	..
2	Constitutional „	68	1	3	4	117·8	6·94
	II. *Local Diseases.* Diseases of the—						
1	Nervous System	10	1	..	1	17·3	1·73
2	Eye..	8	..	..	..	13·9	..
3	Ear..	3	..	..	..	5·2	..
4	Nose	1	..	..	..	1·7	..
5	Circulatory System	8	1	2	3	13·9	5·20
6	Absorbent „	3	..	..	..	5·2	..
8	Respiratory „	36	..	1	1	62·4	1·73
9	Digestive „	164	1	..	1	284·2	1·73
10	Urinary „	64	..	..	..	110·9	..
11	Generative „	17	..	..	..	29·5	..
13	Cellular Tissue	6	..	..	..	10·4	..
14	Cutaneous System..	37	..	..	..	64·1	..
	III. *Conditions, &c.*						
	Debility	2	..	..	..	3·5	..
	IV. *Poisons*	16	1	..	1	27·7	1·73
	V. *Injuries.*						
2	Accidental..	65	..	..	..	112·7	..
	VI. *Surgical Operations* ..	3	..	..	..	5·2	..
	No appreciable Disease	2	..	..	..	3·5	..
	Total	662	5	6	11	1147·3	19·06
	Average of 10 years, 1859–68* ..	..	..	..	..	2223·7	45·78

General Diseases were the cause of one-third of the admissions, and the same proportion of the deaths; two-thirds of the cases were diseases of the febrile group, and one-third, with all the deaths, were of the constitutional group. The following Table shows the influence of the principal diseases of this class on the sickness and mortality:—

* These ratios show the average sickness and mortality of European troops in South China only.

General Diseases.	Admitted.	Died.	Ratio per 1,000 of Mean Strength. 1869. Admitted.	1869. Died.	1859-68. Admitted.	1859-68. Died.
Febrile—						
Eruptive Fevers	..	..	..	..	1·5	·32
Continued „	3	..	5·2	..	249·2	2·88
Paroxysmal „	144	..	249·6	..	653·7	9·39
Malignant Cholera..	..	..	..	..	5·7	3·64
Influenza	1	..	1·7	..	1·9	..
Erysipelas	1	..	1·7	..	·8	·06
Constitutional—						
Rheumatism	18	..	31·2	..	61·0	·13
Syphilis	41	..	71·0	..	164·4	·06
Scrofula, Phthisis, &c.	9	4	15·6	6·94	14·3	2·81
Scurvy and Purpura	..	..	..	..	1·5	·06
Anæmia	..	..	..	..	·9	·06

The admissions by *continued* and *paroxysmal fevers* combined corresponded very closely with the amount in 1868, but were only one-third of the average of the last ten years. There were no deaths by them, while the average mortality during the ten years was as high as 12 per 1,000 of the strength.

There were no cases of *eruptive fevers* nor of *cholera*.

Syphilis.—The decrease in the amount of this disease, which was well marked in 1867 and 1868, was maintained during the year under review. The admissions amounted to only half the average of the last ten years. The decrease is attributed by the Medical Officers to the careful working by the police of a Local Contagious Diseases Act.

Scrofula and *Phthisis* were rather more prevalent, and caused a much higher ratio of mortality than the average of previous years, but the difference may probably be an irregularity arising from the small numbers under observation.

Of Local Diseases those of the *digestive system* furnished much the highest proportion of admissions, but nearly half of them were cases of dyspepsia. Dysentery and diarrhœa were less prevalent than in 1868, and greatly under the average of the last ten years; none of the cases terminated fatally.

The high ratio of admissions by diseases of the *urinary system* was due to the occurrence of 54 cases of gonorrhœa; exclusive of these there were only 10 admissions.

Under the class of Poisons there were 16 admissions and a death, all of them cases of *delirium tremens*.

The Accidental Injuries were slightly in excess of the average, but there were no deaths by them, nor by suicide.

2. Native or Asiatic Troops.

These troops consisted of a Company of Gun Lascars and the 29th Madras Native Infantry. Their average strength was 895 men, among whom there were 533 admissions into hospital and 20 deaths. These numbers give the ratio of 595 admissions, and 22·34 deaths per 1,000 of strength, the former being nearly one-third, and the latter two per 1,000, lower than in the preceding year.

China. The following Table, framed from Abstract No. 21 in the Appendix, shows the influence of the different classes of diseases in causing the sickness and mortality :—

Orders.	Native Troops. Diseases.	Average Strength, 895. Admissions.	Average Strength, 895. Deaths.	Ratio per 1,000 of Mean Strength. 1869. Admitted.	Ratio per 1,000 of Mean Strength. 1869. Died.
	I. *General Diseases.*				
1	Febrile Group	150	..	167·6	..
2	Constitutional „	61	2	68·2	2·23
	II. *Local Diseases.*				
	Diseases of the—				
1	Nervous System	10	2	11·2	2·23
2	Eye	5	..	5·6	..
4	Nose	1	..	1·1	..
5	Circulatory System	2	3	2·2	3·35
8	Respiratory „	37	1	41·3	1·12
9	Digestive „	154	12	172·1	13·41
10	Urinary „	14	..	15·7	..
11	Generative „	2	..	2·2	..
13	Cellular Tissue	20	..	22·3	..
14	Cutaneous System	41	..	45·8	..
	III. *Conditions, &c.*				
	Debility	16	..	17·9	..
	V. *Injuries.*				
2	Accidental..	20	..	22·3	..
	Total	533	20	595·5	22·34
	Average of 10 years, 1859–68 ..	..	..	1575·8	31·67

General Diseases occasioned two-fifths of the admissions ; three-fourths of the cases were of the febrile group. The following Table shows the admissions and deaths by the principal diseases of this class :—

Asiatic Troops. General Diseases.	Admitted.	Died.	Annual Ratio per 1,000 of Strength. 1869. Admitted.	1869. Died.	1859–68. Admitted.	1859–68. Died.
Febrile—						
Eruptive Fevers	1	..	1·1	..	7·6	·34
Continued „	..	..	..	..	41·0	1·72
Paroxysmal Fevers	149	..	166·5	..	676·3	6·20
Malignant Cholera	..	..	..	..	7·6	2·13
Influenza	..	..	..	..	3·2	..
Erysipelas	..	..	..	..	1·4	·14
Constitutional—						
Rheumatism	46	1	51·4	1·12	110·4	·62
Syphilis	3	..	3·3	..	46·0	·21
Scrofula, Phthisis, &c..	2	..	2·2	..	3·8	1·10
Scurvy and Purpura	..	..	..	..	1·5	..
Anæmia	..	..	..	..	1·8	·14
Other Diseases..	10	1	11·2	1·12	..	..

Eruptive Fevers furnished only one admission—a case of smallpox, modified by previous vaccination, in a Gun Lascar. There were no admissions by continued fevers, and those by paroxysmal were 80 per 1,000 of the strength less than in the preceding year, and amounted to only one-fourth of the average of the last ten years.

Rheumatism and *syphilis* were also much under the previous average; indeed, of the latter disease only three cases were admitted, a result attributed by the Medical Officers to the satisfactory working of the Contagious Diseases Act.

There were 8 admissions and 1 death by *beri beri*, all in the 29th Madras Native Infantry. Six of the cases, including the fatal one, occurred in the third quarter of the year, and the other two in the last quarter. We are unable to give any further details respecting them, as they are not noticed in the Reports of the Medical Officers.

As with the European so with the Asiatic troops, *Diseases of the digestive system* were the most prevalent of the class of Local Diseases. The excess was due to the great amount of diarrhœa and dysentery, the former apparently of a very fatal type, 9 deaths having occurred out of 88 cases, all in the Madras Native Infantry. The ratio of admissions by diseases of the *urinary system* was comparatively low, the Asiatic troops having enjoyed a marked exemption from gonorrhœa. The admissions by diseases of the *cutaneous system* would have shown even more favourably than they do but for the occurrence of 21 cases of itch, being more than half of all the cases in this order: they also were exclusively in the Native Infantry. The ratio of admissions by injuries was extremely low, and all the cases were returned as accidental.

SANITARY REPORT.

Deputy Inspector-General Heffernan reports:—

The troops, both European and Asiatic, but particularly the former, have improved in health during the year; indeed, the Europeans have been better than they ever were in any year since Hong Kong has been occupied as a military station; consequently, there have been few complaints from Regimental Medical Officers, and those defects that have been noticed have been

China. mostly small matters of detail that were rectified at the time. However, there are several desiderata necessary to the comfort and well-being of the troops. The state of the lighting of the barracks and hospitals is still unsatisfactory. This is a subject I have adverted to in previous years. I hope the time may come when the authorities will introduce gas into these buildings.

There is still a deficiency of properly constructed barracks to accommodate even the diminished garrison that is now stationed here. Hired buildings are still required, that are unsuited for the purpose, and expensive in reality. This is a subject that will be under consideration during the ensuing year.

New cook-houses, latrines, and other out-buildings are required at the North Barracks, occupied by the Royal Artillery, as the present buildings are badly constructed, and old. They have been inserted in the Annual Estimates by the Royal Engineer Department.

A guard-room and lock-up are required at the Murray Barracks, as those at present in use are badly situated, and imperfectly ventilated. It is difficult, however, to get a proper site for them, and the matter is not yet decided.

Urinals are still required for the European hospital.

The principal sanitary improvements during the year have been the completion of the new barracks, and making surface drains to carry off the water from the ground, about the three blocks, that had been finished in the previous year; putting a pent-house roof over the hospital ship "Meeanee," and adding a covered stairs of entrance to protect sick men from exposure to the sun or rain, when going to, or coming from, the ship; and making temporary accommodation for married soldiers in the trial hut at Kowloon, required by the necessity of removing from the outpost at Stanley, owing to the prevalence of fever during the autumn months.

Constant attention has also been paid during the year to suit the clothing of the men to the state of the weather and season, and to see that the duties were carefully regulated by the season, and all undue exposure avoided; also that there was ample space in the barrack rooms, and local defects in them remedied without delay.

As regards the prevalence of venereal diseases: 1st. There is a Local Act in force entitled "The Contagious Diseases Ordinance of 1867." 2nd. There are not any special arrangements for nightly private ablution, except the ordinary ablution rooms of the barracks and quarters. 3rd. There is a great immunity from venereal diseases, which have not been at all prevalent among the soldiers. The diseases that have been contracted at Hong Kong have not only been few, but mild in character.

II. JAPAN.

Japan. The garrison consisted of half a battery of Royal Artillery, a detachment of Royal Engineers, and the 1st Battalion 10th Regiment. The average strength during the year was 672; the admissions into hospital were 940, and the deaths six, including one of an invalid at Hong Kong *en route* to England. These numbers give the proportion of 1,399 admissions and 8·93 deaths per 1,000 of mean strength, the former higher and the latter lower than the ratio in 1868, and both under the average of the last five years.

The diseases by which the admissions and deaths were caused are stated in Abstract No. 21 in the Appendix, from which the following classified Summary has been framed:—

Japan.

Orders.	Average Annual Strength, 672. Diseases.	Admissions.	Deaths. In Japan.	Deaths. Of Invalids.	Deaths. Total.	Ratio per 1,000, 1868. Admitted.	Ratio per 1,000, 1868. Died.
	I. *General Diseases.*						
1	Febrile Group	86	1	1	2	128·0	2·97
2	Constitutional „	202	..	..	..	300·6	..
	II. *Local Diseases.* Diseases of the—						
1	Nervous System	13	..	..	..	19·4	..
2	Eye	124	..	..	..	184·5	..
3	Ear	5	..	..	..	7·4	..
5	Circulatory System	9	1	..	1	13·4	1·49
8	Respiratory „	30	..	..	..	44·6	..
9	Digestive „	58	..	..	..	86·3	..
10	Urinary „	213	..	..	..	317·0	..
11	Generative	16	..	..	..	23·8	..
12	Organs of Locomotion ..	1	..	..	..	1·5	..
13	Cellular Tissue	18	..	..	..	26·8	..
14	Cutaneous System	60	..	..	..	89·3	..
	IV. *Poisons.* ..	16	1	..	1	23·8	1·49
	V. *Injuries.*						
2	Accidental	89	1	..	1	132·4	1·49
4	Self-inflicted..	..	1	..	1	..	1·49
	Total	940	5	1	6	1398·8	8·93
	Average of five years, 1864-8.	..	..	..	..	1502·3	20·76

GENERAL DISEASES.—The admissions by the febrile group amounted to 128 per 1,000, and by the constitutional to 300·6 per 1,000. The following Table shows the admissions and deaths by each of the principal diseases in these groups:—

General Diseases.	Admitted.	Died.	Annual ratio per 1,000 of Strength. 1869. Admitted.	1869. Died.	1864–68. Admitted.	1864–68. Died.
Febrile—						
Eruptive Fevers ..	1	..	1·5	..	18·7	1·04
Continued „ ..	75	..	111·6	..	84·6	2·08
Paroxysmal „ ..	2	..	3·0	..	139·8	..
Influenza	4	..	5·9	..	3·4	2·85
Erysipelas	1	..	1·5	..	4·9	..
Other Diseases.. ..	3	..	4·5	..	·3	..
Constitutional—						
Rheumatism	15	..	22·3	..	80·2	..
Syphilis..	175	..	260·4	..	314·7	..
Scrofula, Phthisis, &c...	8	1	11·9	1·57	8·6	1·04
Anæmia	4	..	6·0	..	1·3	..

Japan.

Continued Fevers were much above the previous average, but considerably more than half of the cases were returned under the head of febricula, and were probably the result of intemperance; none of them terminated fatally.

Paroxysmal Fevers furnished only two cases. The proportion of admissions corresponds closely with that of 1868, and is very much under the average of previous years—a result, as explained in last Report, of the regiment at Japan having previously served at the Cape of Good Hope, instead of China, as had been the case during the preceding period.

The admissions by *Syphilis* were less numerous than in 1868, but still were excessively high, amounting to one-fourth of the average strength. The total number of cases were 175, and of these 108 were primary veneral sores, and 67 cases of secondary syphilis.

Local Diseases.—Those of the *urinary system* were much the most prevalent, the admissions by them having been 213, or in the ratio of 317 per 1,000, and of these 199, or 186 per 1,000, were cases of gonorrhœa. The admissions by syphilis and gonorrhœa, conjointly, therefore, amounted to 374, or in the ratio of 556 per 1,000 of mean strength; and the average number constantly non-effective from these two diseases was 20, or 3 per cent. of the force.

Diseases of the Eye were also a cause of considerable inefficiency, the admissions having amounted to 124, or 184·5 per 1,000 of strength, 118 being cases of ophthalmia. High as this ratio has been, it shows a considerable decrease upon the results for 1868, when the admissions by ophthalmia amounted to 209 per 1,000 of strength. The disease was almost entirely confined to the 10th Regiment, only five cases having occurred in the Royal Artillery and Engineers.

Poisons.—All the admissions under this class, amounting to 23·8 per 1,000 of the force, were cases of delirium tremens. The death was that of a man of the 10th Regiment, who was returned as "suffocated when drunk."

Injuries.—The admissions under this class closely corresponded with the results of the preceding five years. There were only two deaths, one by accidental drowning, and the other by self-inflicted gunshot.

SANITARY REPORT.

Surgeon J. F. Orton, in medical charge of 1st Battalion 10th Regiment, stationed at Yokohama, reports:—

Yokohama, the only British military station in Japan, has risen on the site allotted a few years ago by the Japanese Government for such foreigners to occupy as chose to avail themselves of the privilege (granted by the Treaty of 1858) of trading at the Port of Kanagawa close by, Kanagawa being commercially the most important seaport in the empire. The growth of the foreign settlement at Yokohama has been, and continues to be, very rapid.

Situated within 13 miles of Yeddo, the capital of Japan, in latitude 32° 56′ North, and longitude 139° 39′ East, it has the great bay of Yeddo, 30 miles long from north to south, and 9 miles across from east to west, stretching in its front, and affording secure anchorage for three or four times the amount of shipping, numerous though it already is, that at this time resorts there.

The port and settlement of Yokohama occupy a flat swampy tract; but the English military force, consisting of one Infantry battalion, two subdivisions of a garrison battery of Artillery, and a few Sappers, are hutted on a high bluff on the south side of the town, where the sea front is a perpendicular cliff from 80 to 120 feet in height.

The general aspect of the neighbouring country is that of a succession of ridges of greater or less width, running inland from the sea, with low rice grounds lying between. The heights are richly wooded, and clad with a luxuriant vegetation, as well of wild as of cultivated growth.

The soil is a light friable loom, generally black, of great depth, and easily worked. It is extremely fertile, and though there is a good deal of waste land, none of that under cultivation is lost advantage of. The rivulets, ponds, and lakes are very numerous, and the facilities these afford for irrigation

render the low-lying lands peculiarly adapted for the cultivation of rice, which, indeed, forms the staple food of the entire population. Wheat, however, is extensively grown on the higher grounds, also barley, millet, beans, peas, buck-wheat, Indian corn, potatoes, sweet potatoes, yams, turnips, carrots, beet, lettuces, leeks, onions, radishes, tomatoes, ginger, the egg plant, gourds, melons, cucumbers, chilies, spinach, capsicums, garlic, endive, fennel, the young shoots of bamboos, and lilies (the roots of many kinds of which are edible), hemp, tobacco, and cotton, are the chief crops and vegetables cultivated in the district; mushrooms are also cultivated, and form an important article of diet and of export for the China market. *Japan.*

The principal fruits met with are grapes, figs, peaches, plums, peas, apples, chesnuts, oranges, lemons, and citrons. The figs and grapes are moderately good, but all the other fruits are of very inferior quality.

The flowers that seem to be indigenous to the country are a great variety of lilies (many of them very beautiful, and rarely met with elsewhere), camelias, azaleas, and varieties of most of the flowers and flowering shrubs that are met with in temperate climates in Europe.

Of timber trees, the conifers are most abundant and most important, both as regards their variety and the numerous useful purposes for which they are employed; but there is no scarcity of excellent hard wood as well, and elms, oak, maples, and planes are plentiful and of good quality; also many excellent timber trees peculiar to Japan. One sort of oak, and the mulberry tree, are largely cultivated in connection with the feeding of silkworms; silk and the silkworms' eggs being perhaps the most important articles of the export trade of the district. Tea is also grown and extensively exported.

The manufactures peculiar to Japan consist of lacquer, ivory and wood carvings, cabinets, and ornamental woodwork, silk gauzes, and heavier silk fabrics, steel swords, knives and daggers, delf, and a coarse kind of porcelain; also a great variety of curios in bronze and silver, &c., and plain and coloured delineations, and silks and other materials; and, lastly, paper, which is made from parts of the bark and fibres of certain trees and plants, and is of every variety of quality and description, and applicable to an incredible variety of uses.

Small-pox is very prevalent early every cold season, and again at the end of the winter. The fevers most commonly met with are typhus and enteric fevers, the latter probably in a great measure due to the general custom which prevails of collecting in open tubs the ordure and urine for manure, and leaving it close to dwellings uncovered, where it often remains unemptied for weeks and months together, rendering the atmosphere in the neighbourhood of dwellings so offensive that foreigners can with difficulty approach them; intermittents and remittents also occur in the swampy rice districts. Venereal diseases are of very general prevalence, as are also skin and eye affections.

The battalion has neither marched nor been on board ship during the past year, but a company has been under canvas from the 21st August to the 21st December, in order to make more room in some of the huts; ophthalmia being very prevalent in the corps. The company encamped was changed about every 30 days. The huts composing the camp are situated on a bluff overlooking the sea, which lies to the north-east. This bluff is the extremity of an elevated plateau, which stretches some miles inland. The part occupied by the English camp being next to the sea, has on either hand a low-lying swampy valley, the most northern of which has the town or foreign settlement of Yokohama on it, and the other valley is cultivated as rice fields. The huts are of wood, and roofed with a layer of lime-mortar over wooden shingles; altogether they are of the most temporary and make-shift construction. They are arranged in a series of parallel lines, generally running north-east and south-west. The main road leading from Yokohama to the British Legation divides the camp into north and south, so called.

As regards height, windows, and doors, &c., the huts should be conducive to health; but owing to irregularity of the ground and confined space, some of the huts, especially in that part of the camp known as the South Camp, are so placed as to be shut out from perfect circulation of pure air around them. The ventilation is imperfect during the cold weather when the men are asleep at night, for at that time all the doors and windows are closed to keep out

Japan. draughts, and the air has at times become impure in consequence. This has been represented, and means for remedying the defect suggested by me, viz., by opening the roof ventilators, and providing regular wall ventilation. The first of these suggestions has been carried out. The warming has hitherto been sufficient by means of open fireplaces in some huts, and stoves in the others. The walls and ceilings have not been lime-washed, excepting in ten huts in the South Camp, where, ophthalmia being prevalent, I strongly recommended cleaning and lime-washing the huts. I have also recommended that the huts in the rest of the camp should be similarly treated, but up to this time it has not been done.

The continued prevalence of ophthalmia in the corps has led me to believe that a greater amount of cubic and superficial space per man is required; also that straw mattresses should be used instead of Japanese straw mats for the men to sleep upon, the straw from the mattresses being easily changed and the bed cases easily washed. My recommendations have not been carried out on these two points.

Deputy Inspector-General Heffernan, in forwarding the Sanitary Report of the 1st Battalion 10th Regiment, at Yokohama, directed the attention of the Major-General Commanding to some of the remarks contained in it, with the view of making the following comments thereon :—

"Surgeon Orton states that the ventilation of the huts was imperfect, "and that his suggestion of providing wall ventilation was not attended to. "It was quite right to have the ridge ventilators opened, and they should not "have been allowed to become closed up; but I do not consider his suggestion "of having holes cut in the walls of the huts, near the floor, was a good one."

"He further states that the walls and ceilings of the huts were not lime-"washed, as he recommended. This may have been done since, as advised by a "Medical Board held in December last, but if not, I would observe that size "should be mixed with limewash used for the interior of wooden huts, to "prevent the lime coming off in the shape of dust that would be likely to "irritate the eyes of men already predisposed to ophthalmia. Some of the "huts in the camps have been already limewashed; in those instances it should "be repeated twice a-year, as directed by regulation for barrack rooms.

"Those huts that have not been limewashed as yet would, I think, be "better treated by being well washed with soap and water, and then brushed "over with a solution of disinfecting fluid, twice a year, or oftener in any hut "where ophthalmia was particularly prevalent."

"Lastly, he states that a greater amount of cubic space per man is required, "but the average cubic space per man is given as 624 feet. This amount, in "my opinion, ought to be a sufficient allowance in huts; and it will have "been increased since the departure of the invalids and time-expired men.

"In the same answer he also states that his recommendation of the substitu-"tion of straw mattresses for the mats, then in use, has not been attended to, "but hair beds have been sanctioned, which I consider are much superior to "either."

Section II.

On the Extent of Invaliding.

China and Japan. The number of invalids sent to England during the year was 63, and of those finally discharged the Service at Netley 29, being respectively in the ratio of 50·44, and 23·22 per 1,000 of mean strength, both much higher than in 1868, though not differing very materially from the average of the preceding years.

Of the Asiatic troops, 27 were sent to Madras, being in the ratio of 30·17 per 1,000 of mean strength. We have no information respecting the numbers ultimately discharged the Service. The disabilities of the invalids are shown in Abstract No. 22 in the Appendix, of which the following is a classified Summary :—

China and Japan.

	White Troops		Asiatic Troops
Mean Strength	1,249		895
	Sent as Invalids to England.	Discharged as Invalids in England.	Sent as Invalids to India.
Paroxysmal Fevers	3	..	..
Rheumatism	5	1	2
Syphilis	5	1	..
Scrofula and Phthisis	10	6	..
Beri Beri	..	..	3
Diseases of the—			
Nervous System	2	..	3
Eye	29	14	..
Circulatory System	3	1	..
Respiratory „	1	1	2
Digestive „	2	2	6
Urinary „	1	1	2
Generative „	1	..	1
Organs of Locomotion..	..	1	..
Cellular Tissue..	1	..	..
General Debility	..	..	7
Accidental Injuries	..	1	1
Total	63	29	27
Annual ratio per 1,000 of { 1869 ..	50·44	23·22	30·17
Mean Strength.. .. { 1861–8 ..	53·80	21·96	18·82

The proportion of invalids sent to England was slightly under, and of those discharged the Service slightly over, the average. Diseases of the eye were the cause of invaliding, in nearly half of them; scrofula and phthisis were next in frequency. Of the Asiatic troops, the proportion sent to India was considerably above the average, but that, from circumstances noticed in previous Reports, had been in some years exceptionally low. Dysentery and diarrhœa were the most prominent causes of invaliding in this class of troops.

Section III.

Mean Daily Sick.

The average number constantly sick of the European troops in China was 24, or 41·59 per 1,000 of the strength, and in Japan 58, or 86·31 per 1,000—both a little under the ratio in the preceding year. Among the Asiatic troops the number amounted to 26, or 29·05 per 1,000 of mean strength, which was 11 per 1,000 under the proportion in 1868, and 21 per 1,000 under the average of the last eight years.

The usual information on this subject, based on these numbers, is given in the following Table:—

China and Japan.

		European Force.		Asiatic Force.
		China.	Japan.	China.
Ratio per 1,000 of Strength constantly Sick	1869..	41·59	86·31	29·05
	1861-8	77·43	86·34	50·09
		days.	days.	days.
Average Sick Time to each Soldier ..	1869..	15·22	31·50	17·80
	1861-8	28·26	31·51	18·28
Average duration of Cases	1869..	13·26	22·52	10·60
	1861-8	14·84	21·44	14·52

Compared with the results for 1868, there has been a reduction in all these particulars, except in the average sick time to each soldier of the Asiatic Force, which shows an increase of three days.

Compared with the average of a number of years, there has been a very marked improvement in China among both the European and Asiatic troops; but the results for Japan have corresponded very closely with the average of the five years during which Yokohama has been occupied by European troops.

Section IV.

Influence of Age on the Mortality.

The following Table shows the influence of age on the mortality of the troops in China and Japan, in quinquennial periods of life. The numbers for the Artillery are applicable only to those serving in China, the Return for Japan not being available:—

	European Troops.											
	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.	
European Troops.	Strength.	Died.	Strength.	Died.	Strength.	Died.	Strength.	Died.	Strength.	Died.	Strength.	Died.
Royal Artillery	..	..	14	..	32	..	14	..	5	1	..	..
1st Bn. 10th Regiment	35	..	160	..	265	3	119	..	53	1	10	..
75th Regt., Left Wing	61	..	159	2	92	1	73	3	29	1	2	1
Total	96	..	333	2	389	4	206	3	87	3	12	1
Ratio per 1,000 .. 1869..			6·0		10·28		14·56		34·48		83·	
Ratio per 1,000 .. 1861-8	6·05		37·60		57·28		57·44		140·23		176·47	
Asiatic Troops.												
Gun Lascars	1	..	16	..	25	..	15	1	4	..	5	..
29th Madras N. I. ..	76	1	275	2	235	4	114	8	73	4	55	..
Total	77	1	291	2	260	4	129	9	77	4	60	..
Ratio per 1,000 .. 1869..	13·00		6·87		15·38		69·76		51·95		..	
Ratio per 1,000 .. 1867..	20·83		38·83		68·34		34·89		108·91		80·00	

China and Japan.

The Returns for the European troops show a very rapid deterioration of life with the advance of age. There is a break in the progressive increase at the age 30 and under 35, due probably to the operation of the Limited Enlistment Act. The number of the Asiatic troops, the Returns of which extend over only two years, has been too small to justify any positive deductions; but there has been, in this case also, a very great increase of mortality with the advance of age.

XII.—STRAITS SETTLEMENTS.

Straits Settlements.

The troops employed consisted of two Batteries Royal Artillery throughout the year, a detachment of the 73rd Regiment from the beginning of the year, and the right wing from 8th January till 8th March, and the left wing of the 75th Regiment from 27th February till the end of the year. The average strength for the year was 541, the admissions into hospital were 612, and the deaths were 3. The admissions, therefore, were in the ratio of 1,131, and the deaths of 5·55 per 1,000 of mean strength, both very much below the average of the preceding five years.

The following Table, framed from Abstract No. 18 in the Appendix, shows the influence of the different classes of diseases in causing the sickness and mortality :—

Orders.	Diseases.	1869.			
		Mean Strength, 541.		Annual Ratio per 1,000 of Strength.	
		Admissions.	Deaths.	Admissions.	Deaths.
	I. *General Diseases.*				
1	Febrile Group	119	..	220·0	..
2	Constitutional „	66	1	122·0	1·85
	II. *Local Diseases.*				
	Diseases of the—				
1	Nervous System	8	..	14·8	..
2	Eye	7	..	12·9	..
3	Ear	7	..	12·9	..
5	Circulatory System	8	..	14·8	..
6	Absorbent „	5	..	9·2	..
8	Respiratory „	22	..	40·7	..
9	Digestive „	128	1	236·6	1·85
10	Urinary „	68	..	125·7	..
11	Generative „	14	..	25·9	..
12	Organs of Locomotion ..	2	..	3·7	..
13	Cellular Tissue	23	..	42·5	..
14	Cutaneous System	60	..	110·9	..
	IV. *Poisons.* ..	9	1	16·6	1·85
	V. *Injuries.*				
2	Accidental	66	..	122·0	..
	Total	612	3	1131·2	5·55
	Average of 5 years, 1864–8..	..	..	1557·3	16·08

General Diseases.—The febrile group of this class furnished one-fifth of all the admissions ; nearly one-half of them were returned under the head of febricula, and most of the remainder were cases of ague. The admissions under syphilis amounted to 41, or 76 per 1,000 of the strength.

Of the LOCAL DISEASES those of the digestive system were most prevalent, amounting to upwards of a fifth of all the admissions. This high proportion was, in a great measure, due to the large number of cases of dyspepsia, and also, though in a less degree, to diarrhœa. There were only 9 cases of dysentery, of which, however, one proved fatal, and 10 of hepatitis admitted. The high ratio of diseases of the urinary system was caused by gonorrhœa, of which there were 46 cases, with 16 of bubo. The admissions by diseases of the circulatory system amounted only to 8, or 14·8 per 1,000, contrasting very favourably with the large number of cases admitted in 1868 to the extent of 98·4 per 1,000 and attributed by the Medical Officer to an irritable condition of the heart. There has also been a very marked reduction in the cases of boils and ulcers. The 3 deaths which occurred during the year were from consumption, dysentery, and delirium tremens. *Straits Settlements.*

It seems probable that the great reduction in the sickness and mortality compared with previous years was the result of the corps which formed the garrison having come from England and the Cape, and consequently not deteriorated by previous tropical service, while during the preceding years the garrison had been furnished from Madras, where the men had contracted a liability to paroxysmal fever and to dysenteric and hepatic affections.

Invaliding.—There were 10 invalids sent to England during the year from the Straits Settlements, and 8 were finally discharged the Service at Netley, being respectively in the ratio of 18·5 and 14·8 per 1,000 of mean strength. Disease of the heart was the disability in 5 out of the 8 discharged at Netley. The disabilities of the invalids sent home and finally discharged are stated in Abstract No. 19 in the Appendix.

Mean Sick.—The average number constantly non-effective from sickness throughout the year was 21, or in the ratio of 38·81 per 1,000 of mean strength, considerably under the proportion in the preceding year. The average sick time to each soldier was 14·17 days, and the duration of the cases was 12·52 days, the former, compared with the results for 1868, being a decrease of 7½, and the latter of 1¼ days.

SANITARY REPORT.

Assistant Surgeon Lindsay, 75th Regiment, the Senior Medical Officer, reports:—

"The most noticeable, because the more specially belonging to the climate and station, among the classes of disease reported are the fevers and digestive complaints. At Singapore, in low situations where the atmosphere is not always kept in motion by fresh breezes, and a sufficient elevation over swampy land is not attained, the miasmata are active and productive of fevers, slight in the severity of individual cases, but serious from their frequency and their debilitating consequences; and even in some well-elevated and apparently well-disposed positions, such as Tanglin, where the wing of the 75th Regiment are quartered, the miasmata show themselves in the fevers which result from them. This probably is caused by the close neighbourhood of uncleared jungle, on heights of nearly equal elevation to the barracks, and of low grassy marshy ground, in the valleys near, the elevation above which, about 80 feet, seems not to be sufficient to insure immunity from their exhalations. In the course of time, as the Colony advances, these conditions will gradually disappear, and probably with them the chief part of the malarious diseases which I attribute to them. At Fort Canning, around which civilization has already extended, and cleared the country for two or three miles, and which is also at a considerable altitude above the surrounding district, there has been hardly any fever among the troops. The fevers that have occurred in the Command have been of various types; in the early part of the year a few cases of simple continued fever, and of remittent fever, were treated in hospital; but the majority of the cases during the year have been of ague and febricula,—cases that have been severe enough at the time, and numerous, but have never remained long in

Straits Settlements.

hospital. Ague and febricula occur almost indiscriminately, and although the distinctive periodic or continued character of the attack is generally clearly enough recognised, there seems to be little difference in the essential nature of the two types as seen here. They both seem to owe their existence to the same causes—to malaria and climate—and the difference in their manifestation to some temporary accidental peculiarity in the condition of the constitution of the individual, rather than to any variation in the poison. Digestive diseases form a large proportion of the sickness shown in this Return. The constant amount of sickness from fevers has been nearly equalled by the bowel complaints—dysentery and diarrhœa—and has been exceeded by that from dyspepsia itself alone. These are almost entirely attributable to the climate, to the constant moist high temperature of the atmosphere, and, perhaps, also to the same malaria that produces the fevers. The food in general is good and wholesome, sufficient in quantity, and as varied as is requisite. The water for drinking is not so satisfactory, but it is difficult to suggest a feasible mode for improving it. It is obtained from wells which are, like wells in India, mere open-mouthed pits, into which the rain beats freely, and the surface water flows or percolates without difficulty, while the soil and matter about them is easily disturbed, and hard to clear away again, and after heavy rains the water is with difficulty rendered sufficiently good to drink by filtration. It was suggested to have a few of Norton's patent tube wells sunk, which would be easy, a great depth not being required, and would ensure a supply of good water; but the suggestion has never been acted on. Respiratory diseases have been few and unimportant, with the exception of three or four cases of phthisis pulmonalis. The climate, with its constantly mild, warm, humid atmosphere, seems to have a beneficial effect on slight bronchitic attacks, and it is only in those cases which, occurring in tubercular or ill-nourished constitutions, tend to phthisis, that the climate seems to have a bad effect by its debilitating and enervating nature. The equability of the seasons, and the constant high temperature and humidity, are generally detrimental to the tone of the physical constitution, and cause a feeling of enervation and languor, and general malaise and weakness, which leads the way, without difficulty, to more positive complaints, and the longer the subjection to its influences, the more are its effects apparent.

"The climatic causes of disease vary in manner and potency at different periods rather of the twenty-four hours than of the year. The miasmata are palpably more dense in the early morning before the sun has acquired power to dissipate the fogs which fill all the valleys, and are even sometimes seen enveloping the lower heights. During the heat of the day the direct power of the sun tends to develop the influence of the miasmata already received in the constitution, and to induce a morbidly great or irregular action of the heart, which sometimes terminates in more serious mischief, and after sundown, when heavy dews are descending, although the feeling of cool refreshment and relief is grateful, the chills to which the system is then liable are apt to induce bowel complaints, and the alternation from the heat of the day to promote fevers. The periods—between the dissipation of the early morning fogs, and the time when the heat of the sun becomes great, and again when the heat of the day has declined, but night has not yet fallen—are the safe and healthy times, to which all outdoor duty and exercise should be confined as much as possible.

"This enervating power of the climate, combined with the daily recurring midday heat of the sun, seems often to tell specially on the heart; and cases of heart complaints have occurred, commencing with a mere abnormal degree of palpitation, but growing by degrees worse, till organic disease has arisen out of the primary functional derangement. The heat of the climate, of which no season brings any sensible remission, is perhaps to be chiefly blamed for the heart diseases.

"The sanitary conditions of the station in general, as far as they can be maintained by art, have been very good. There has not been any change in the accommodation of the troops in any of the barracks during the year, or in any of the leading sanitary arrangements. The ventilation of all the barracks has been good, and no increased means for it have been needed or suggested. There has been a swimming bath constructed in Tanglin Barracks

Straits Settlements.

for the men; but there is still nothing of the kind available for the Royal Artillery, and bathing in the sea is not allowable by reason of the danger from sharks and alligators, which are numerous about the coast. The means of washing in the ablution rooms are sufficient for the purposes of ordinary personal ablution. The means of cooking the rations are sufficient to give a fair variety in the mode of preparing the food of the troops, and have not demanded any alteration during the year. The only change in the diet of the troops has been at Tanglin, where, ever since the month of June, the men of the wing, 75th Regiment, have contributed a daily penny extra per man for adding to their rations, rice, vegetables, &c. The rations are good, and do not appear to call for any increase or alteration. The equability of the climate renders any general change in the clothing, from season to season, unnecessary. Only at occasional times of heavy rains and chilly wet storms of wind, do the men on duty wear serge clothing. The drainage about the barracks has been good, and the sanitary condition of their immediate vicinity is also good and wholesome.

"The largest amount of sickness caused by any single class of diseases is that due to venereal. The ratio constantly sick from this cause has been about 9 in a strength of 1,000 men. There is no Legislative Act or Police Regulation in force for the purpose of repressing venereal disease, which is to be regretted. At one time the evidence and opinions were taken, by the Civil Authorities of the Colony, of several Medical Officers regarding this subject, and there seemed a probability of something being done; but the idea seems to have died away again. There has been a great difference in the relative prevalence of venereal disease in the Royal Artillery at Fort Canning, and in the wing 75th Regiment at Tanglin, at the same station, which has been owing, in a great measure, to the near neighbourhood of the former to the town of Singapore, and the distance of the latter. This would seem to show the existence of a sufficiently well-defined limit, within the bounds of which, if a Police Act for the purpose existed, it might be made to serve with considerable efficiency and advantage."

LABUAN.

Labuan. The Force at Labuan consisted, during the year, of a detachment of the Ceylon Rifles, of the average strength of 162 men, among whom 10 deaths occurred, being in the ratio of 61·73 per 1,000 of the strength. The causes of death were—

Remittent Fever	6
Bronchitis	2
Dysentery	1
Phlegmon	1
	10

Unfortunately no returns have been received at this Department for the period under review, so that we are unable to give any information regarding the amount of sickness and the diseases which have been prevalent.

XIII.—ON THE HEALTH OF THE TROOPS SERVING IN INDIA.

Section I.

Sickness and Mortality.

India.

The average strength of the European troops serving in the three Indian Commands during the year 1869 was 55,988; the admissions into hospital were 89,140, and the deaths 2,080, including 85 among invalids on their passage home and at Netley. These numbers give the ratio of 1,592 admissions and 37·15 deaths per 1,000 of mean strength, both much higher than in the preceding year. The admissions were slightly below, but the deaths were 9·49 per 1,000 above, the average of the last nine years.

The following Table shows the admissions in each of the Presidencies during the year:—

	Average Strength.	Admissions into Hospital.	Deaths.			Ratio per 1,000 of Mean Strength.			
						1869.		1860–68.	
			In India.	Of Invalids.	Total.	Admitted.	Died.	Admitted.	Died.
Bengal	35,173	59,390	1,523	50	1,573	1,688	44·72	1,672	29·89
Madras	10,277	13,654	246	25	271	1,329	26·37	1,395	22·17
Bombay	10,538	16,096	226	10	236	1,527	22·40	1,522	23·58

The admissions in Bengal and Bombay were slightly above the average of the last nine years, but in Madras they were below it. The mortality in Bengal was greatly above the average, and higher than in any of the last nine years except 1861. In Madras, also, it was above the average, though to a much less extent than in Bengal, while in Bombay it was 1·18 per 1,000 under the average.

Bengal.

STATISTICAL REPORT.

Bengal.

It is much to be regretted that the non-receipt of a considerable portion of the necessary documents from this Presidency renders it quite impossible at present to give the usual details respecting the causes of sickness and mortality. We trust to be able to give them at no distant date in the form of a supplementary Report.

II.—Madras.

STATISTICAL REPORT.

Madras. The average strength of the European troops in the Madras Command in 1869 was 10,277; the admissions into hospital were 13,654, and the deaths 271, including 25 among invalids on their passage home and at Netley. These numbers give the ratios of 1,329 admissions and 26·37 deaths per 1,000 of mean strength, the former being 70 per 1,000 under, and the latter 2·65 per 1,000 above, the proportion in the preceding year.

The diseases by which the admissions and deaths were caused are detailed in Abstract No. 23 in the Appendix, from which the following Classified Summary has been framed :—

Orders.	Diseases.	Strength, 10,277.				Ratio per 1,000 of Mean Strength, 1869.	
		Admitted.	Deaths.			Admitted.	Died.
			In the Command.	Of Invalids.	Total.		
	I. *General Diseases.*						
1	Febrile Group	2,298	55	..	55	223·6	5·35
2	Constitutional ,, ...	1,952	16	7	23	189·9	2·24
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	264	37	..	37	25·7	3·60
2	Eye	260	..	..	..	25·3	..
3	Ear	63	..	..	..	6·1	..
4	Nose	2	..	..	..	·2	..
5	Circulatory System	124	15	5	20	12·1	1·95
6	Absorbent ,, ...	177	..	..	..	17·2	..
8	Respiratory ,, ...	445	5	1	6	43·3	·58
9	Digestive ,, ...	3,705	86	9	95	360·5	9·24
10	Urinary ,, ...	1,075	1	..	1	104·6	·10
11	Generative ,, ...	185	..	..	..	18·0	..
12	Organs of Locomotion	57	..	..	..	5·5	..
13	Cellular Tissue	161	..	..	..	15·7	..
14	Cutaneous System	1,029	..	..	..	100·1	..
	III. *Conditions, &c.*						
	Debility	329	1	3	4	32·0	·39
	IV. *Poisons*	276	12	..	12	26·9	1·17
	V. *Injuries.*						
2	Accidental	1,237	10	..	10	120·4	·97
3	Homicidal	..	2	..	2	..	·20
4	Self-inflicted	2	6	..	6	·2	·58
	No appreciable disease	13	..	..	..	1·3	..
	Total	13,654	246	25	271	1328·6	26·37
	Average of 9 years, 1860–68..	..	..	..	..	1395·5	22·17

GENERAL DISEASES.—The febrile group of this class was the cause of one-sixth, and the constitutional of one-seventh of all the admissions into hospital, and the deaths by the class amounted to two-sevenths of the total mortality.

The following Table shows the admissions and deaths by the principal diseases in the two groups :—

General Diseases.	Admitted.	Died.	Ratio per 1,000 of Mean Strength.			
			1869.		1860-68.	
			Admitted.	Died.	Admitted.	Died.
Febrile—						
Eruptive Fevers	12	3	1·2	·29	1·1	·09
Continued „	892	15	86·8	1·46	83·6	1·21
Paroxysmal „	1,290	10	125·5	·97	164·6	·69
Malignant Cholera	39	23	3·8	2·24	5·2	2·75
Choleraic Diarrhœa	18	3	1·7	·29	..	..
Influenza	27	..	2·6	..	7·2	..
Erysipelas	15	..	1·5	..	1·9	·09
Other Diseases of this group	5	1	·5	·10	..	..
Constitutional—						
Rheumatism	530	..	51·5	..	60·0	·04
Syphilis	1,174	3	114·2	·29	129·0	·29
Scrofula, Phthisis, &c. ..	151	18	14·7	1·75	16·5	2·18
Scurvy and Purpura ..	8	1	·8	·10	·5	·02
Anæmia	74	..	7·2	..	1·8	..
Other Diseases of this group	15	1	1·5	·10	..	..

Eruptive fevers were not more than usually prevalent. Of the 12 admissions 10 were by small-pox, and of these 3 died ; 5 of the cases and one of the deaths occurred in the 90th Regiment at Kamptee and Seetabuldee.

Continued fevers were more prevalent than in 1868, but the proportion of admissions and deaths differed little from the average of the last nine years.

Paroxysmal fevers were less prevalent than in 1868, and considerably under the average of the nine years. The mortality was slightly in excess of the average.

Malignant cholera and *choleraic diarrhœa* were much more prevalent and fatal than in 1868, but the ratio of admissions and deaths was under the average of the last nine years. Cholera broke out as an epidemic in the 45th Regiment at Fort St. George, and in a detachment of it which was sent to Palaveram, causing 18 admissions and 12 deaths. It also prevailed as an epidemic among the troops at Kamptee and in Birmah.

Rheumatism was slightly in excess of the amount in 1868, but was under the average of previous years, and *syphilis* was 15 per 1,000 below the average, and 30 per 1,000 lower than in 1868.

Scrofula and *Phthisis* were slightly above the proportion in the preceding year, but were under the average both in admissions and deaths.

Anæmia.—The admissions under this head were greatly above the average ; the excess was caused by 43 cases in the 18th Hussars at Secunderabad, stated by the Surgeon of the corps to have been the result " of the regiment having " served so long in this trying climate."

LOCAL DISEASES.—Those of the *nervous system* were a cause of considerable mortality, due chiefly to apoplexy and sunstroke, each of which occasioned 15 deaths. Of the latter, 3 deaths occurred in April, 11 in May, and one in June ; the deaths by apoplexy were spread over a greater period of time, 5 having occurred in May, 2 each in March, April, and June, and 1 in January, February, July, and August. The 18th Hussars had the greatest number of cases—18, of which 3 died, and the 2nd Battalion 10th Regiment of deaths, 4 having occurred in 6 cases.

Madras. *Diseases of the eyes* were much less prevalent than in 1868, when the admissions by ophthalmia amounted to 34 per 1,000, being exactly the average of the Command. In the year now under review the admissions by ophthalmia were only 23 per 1,000, the ratio by other diseases of the eye being 2·7 per 1,000.

Diseases of the circulatory and respiratory systems differed little from the results of preceding years. The mortality by the former was a little above the average; the excess was mainly due to deaths among the invalids sent to England. Aneurism was the most fatal disease of the circulatory system, 12 out of 20 deaths having been referred to it.

Diseases of the digestive system were the most prevalent and fatal of the local diseases, and gave rise to nearly one-fifth of all the admissions into hospital, and to upwards of one-third of all the deaths in the Command. Dysentery, diarrhœa, and hepatitis were much the most prevalent diseases, and the cause of all but 2 of the deaths. The admissions by the two first were in the ratio of 156 per 1,000 of mean strength, or more than double that of the preceding year, and the deaths were 2·53 per 1,000, being considerably higher than in 1868, but not differing materially from the average of the last nine years; the admissions by hepatitis were in the ratio of 75, and the deaths of 5·64 per 1,000, both slightly under the proportion in the preceding year.

Diseases of the urinary system.—The high ratio of admissions by this class was entirely due to gonorrhœa and its consequences, the other diseases of this order having caused very few admissions; among them, however, were three of calculus, a disease rarely met with among the European troops.

Diseases of the cutaneous system did not differ much from the average of the Command. The cases of guinea worm amounted to 39, being nearly double the number in 1868, but considerably lower than in the preceding years.

Accidental Injuries gave a lower proportion of admissions and deaths than in 1868. There were 6 *suicidal deaths* recorded, 3 by gunshot, 1 by cut-throat, 1 by drowning, and 1 by poisoning by opium.

The following Table shows the admissions and deaths during the year at each of the principal military stations in the Command:—

Stations.		Average Annual Strength.	Admitted into Hospital.	Died in India.	Ratio per 1,000 of Strength.			
					Admitted.	Died.	Average of previous Period.	
							Admitted.	Died.
Presidency Circle.	Fort St. George and Palaveram	852	894	22	1049·3	25·82	1711·8	20·01
	St. Thomas's Mount	485	575	14	1185·6	28·86		
	Trichinopoly ..	288	393	6	1364·6	20·83	1460·9	15·56
Mysore Circle.	Bangalore ..	1,658	1,883	24	1135·7	14·47	1020·2	14·52
	Cannanore ..	674	625	15	927·3	22·25	1178·8	12·30
	Calicut	29	36	..	1241·4	..	839·1	18·33
	Malleapooram ..	82	73	1	890·2	12·19	1076·9	21·28
	Bellary	864	1,096	7	1268·5	8·10	1488·1	16·68
Hyderabad Circle.	Secunderabad ..	2,057	2,915	76	1417·1	36·94	1527·7	22·82
	Kamptee	758	1,388	28	1831·1	36·93	1641·2	18·69
	Seetabuldee ..	31	43	2	1387·1	64·51	..	..
	Chindwarrah ..	15	23	..	1533·3	..	1961·8	26·47
Birmah Circle.	Rangoon	792	1,338	9	1689·4	11·36	1251·8	13·89
	Thayetmyo ..	475	687	13	1446·3	27·36	1385·0	25·04
	Tonghoo	321	291	3	906·5	9·34	1281·1	15·05
	Port Blair ..	114	110	..	964·9	..	1613·2	16·51
Depôts ..	Poonamallee ..	139	508	11	3654·7	79·13	2526·6	74·98
	Ramandroog ..	46	46	1	1000·0	21·73	2049·6	45·80
	Wellington ..	392	513	6	1308·7	15·30	1158·1	17·90
Troops on the March		202	217	8	1074·2	39·60	..	..

Omitting the Depôts and the very small stations, this Table shows the admissions to have been above the average at Bangalore, Kamptee, Rangoon, and Thayetmyo, and to have been below at all the other large stations: the ratio of mortality was below the average at Bellary, Rangoon, and Tonghoo, it was exactly the average at Bangalore, and was above it at all the other large stations. Kamptee was the station at which the admissions were highest, and it and Secunderabad furnished the highest ratio of mortality except the Depôt at Poonamallee, and the small station of Seetabuldee, where there were only 31 men.

The influence of the different classes of diseases in producing sickness and mortality in each of the circles is shown in the following Table :—

Order.	Stations	Presidency Circle.		Mysore Circle.		Hyderabad. Circle.		Birmah Circle.		Depôts.		On the March.		Presidency Circle.		Mysore Circle.		Hyderabad Circle.		Birmah Circle.		Depôts.		On the March.	
	Strength	1,625		3,226		2,861		1,703		659		202		Annual Ratio per 1,000 of Strength.											
	Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*																								
1	Febrile Group	205	12	529	3	994	29	403	8	126	3	41	...	126·1	7·38	164·0	·93	347·4	10·14	236·6	4·69	191·2	4·55	203·0	...
2	Constitutional ,, ...	261	6	491	2	563	5	338	1	263	2	39	...	160·6	3·69	152·2	·62	196·8	1·75	198·5	·59	399·1	3·03	193·1	...
	II. *Local Diseases.*																								
	Diseases of the—																								
1	Nervous System	31	3	36	4	104	22	45	5	44	3	4	...	19·1	1·85	11·2	1·24	36·4	7·69	26·4	2·94	66·8	4·55	19·8	...
2	Eye	30	...	93	...	92	...	31	...	14	...	1	...	18·5	...	28·8	...	32·2	...	18·2	...	21·2	...	4·9	...
3	Ear	13	...	11	...	16	...	17	...	4	...	...	...	8·0	...	3·4	...	5·6	...	10·0	...	6·1	...	...	...
4	Nose	...	...	1	...	1	...	...	...	...	...	...	...	...	...	·3	...	·3	...	...	...	...	...	...	...
5	Circulatory System	16	3	41	5	30	4	22	1	14	1	1	...	9·8	1·85	12·7	1·55	10·5	1·40	12·9	·59	21·2	1·52	4·9	...
6	Absorbent ,, ...	24	...	51	...	84	...	7	...	8	...	2	...	14·8	...	15·8	...	29·4	...	4·1	...	12·1	...	9·9	...
8	Respiratory ,, ...	58	1	127	2	117	2	95	...	45	...	7	...	35·7	·61	39·4	·62	40·9	·70	55·8	...	68·3	...	34·7	...
9	Digestive ,, ...	321	8	1,019	23	1,319	35	630	5	359	9	65	...	197·5	4·92	315·9	7·13	461·0	12·23	369·9	2·94	544·8	13·66	321·8	...
10	Urinary ,, ...	291	...	243	1	326	...	148	...	51	...	16	...	179·1	...	75·3	·31	113·9	...	86·9	...	77·4	...	79·2	...
11	Generative ,, ...	29	...	61	...	60	...	30	...	6	...	...	...	17·8	...	18·9	...	21·0	...	17·6	...	9·1	...	...	...
12	Organs of Locomotion	3	...	14	...	19	...	10	...	9	...	1	...	1·8	...	4·3	...	6·6	...	5·9	...	13·7	...	4·9	...
13	Cellular Tissue	18	...	48	...	48	...	20	...	11	...	7	...	11·1	...	14·9	...	16·8	...	11·7	...	16·7	...	34·7	...
14	Cutaneous System	179	...	339	...	250	...	190	...	59	...	7	...	110·2	...	105·1	...	87·4	...	111·6	...	89·5	...	34·7	...
	III. *Conditions, &c.*																								
	Debility...	99	...	35	...	50	...	98	...	4	...	5	1	60·9	...	10·9	...	17·5	...	57·5	...	63·7	...	24·7	4·95
	IV. *Poisons*	116	3	83	2	24	4	42	2	10	1	1	...	71·4	1·86	25·7	·62	8·4	1·40	24·7	1·17	15·2	1·52	4·9	...
	V. *Injuries.*																								
2	Accidental	166	3	414	2	271	2	292	3	75	...	20	...	102·2	1·85	128·3	·62	94·7	·70	171·5	1·76	113·8	...	99·0	...
3	Homicidal	...	2	...	...	...	...	...	...	...	...	...	...	...	1·23	...	...	...	...	...	...	...	...	...	...
4	Self-inflicted	...	1	...	2	...	3	1	...	...	...	...	...	...	·61	...	·62	...	1·04	·6	...	...	...	...	...
	VI.																								
	Surgical Operations	...	...	1	...	...	...	...	...	...	...	...	...	...	...	·3	...	...	...	...	...	...	...	...	...
	No appreciable disease	2	...	3	...	1	...	7	...	...	...	...	...	1·2	...	·9	...	·3	...	4·1	...	...	...	...	...
	Total	1,862	42	3,640	46	4,369	106	2,426	25	1,140	19	217	1	1145·8	25·84	1128·3	14·26	1527·1	37·05	1424·5	14·68	1729·9	28·83	1074·2	4·95

Stations	Presidency Circle.		Mysore Circle.		Hyderabad Circle.		Birmah Circle.		Depôts.		On the March.		Presidency Circle.		Mysore Circle.		Hyderabad Circle.		Birmah Circle.		Depôts.		On the March.	
Strength	1,625		3,226		2,861		1,703		659		202		Annual Ratio per 1,000 of Mean Strength.											
General Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Febrile—																								
Eruptive Fevers	...	...	1	...	8	2	1	...	2	1	...	...	...	...	·3	...	2·8	·70	·6	...	3·0	1·52	...	...
Continued ,, ...	109	1	259	2	282	8	168	3	48	...	26	...	67·1	·61	80·3	·62	98·6	2·80	98·7	1·76	72·3	...	128·7	...
Paroxysmal Fevers	72	...	253	1	664	7	211	1	75	2	15	...	44·3	...	78·4	·31	232·1	2·44	123·9	·59	113·9	3·03	74·2	...
Malignant Cholera	17	11	...	...	9	8	13	4	...	...	...	...	10·4	6·77	...	...	3·1	2·80	7·6	2·34	...	...	...	...
Choleraic Diarrhœa	2	...	3	...	13	3	...	...	...	...	...	...	1·2	...	·9	...	4·5	1·05	...	...	...	...	...	...
Influenza	...	...	6	...	11	...	6	...	...	...	...	...	...	...	1·9	...	3·8	...	3·5	...	...	...	...	...
Erysipelas	5	...	4	...	5	...	4	...	1	...	...	...	3·1	...	1·2	...	1·8	..	2·3	...	1·5	...	...	...
Other Diseases	...	...	3	...	2	1	...	...	...	...	...	...	...	...	·9	...	·7	·35	...	...	...	...	...	...
Constitutional—																								
Rheumatism	48	...	161	...	132	...	129	...	58	...	2	...	29·6	...	49·9	...	46·1	...	75·7	...	88·0	...	9·9	...
Syphilis	184	...	284	1	347	1	170	1	156	...	32	...	113·2	...	88·0	·31	121·3	·35	99·8	·59	236·7	...	158·4	...
Scrofula, Phthisis, &c.	24	5	26	1	26	4	27	...	40	1	5	...	14·8	3·08	8·1	·31	9·1	1·40	15·9	...	60·7	1·52	24·7	...
Scurvy and Purpura	1	1	6	...	...	...	...	...	1	...	...	...	·6	·61	1·9	...	...	...	...	...	1·5	...	...	...
Anæmia	2	...	9	...	53	...	5	...	5	...	...	...	1·2	...	2·8	...	18·5	...	2·9	...	7·6	...	...	...
Other Diseases	2	...	5	...	4	...	3	...	1	1	...	...	1·2	...	1·5	...	1·4	..	1·8	...	1·5	1·52	...	...

Madras. GENERAL DISEASES.—Omitting the Depôts from the comparison for obvious reasons, the ratio both of admissions and deaths by this class has been highest in the Hyderabad Circle, and the excess has been much more marked in the febrile than in the constitutional diseases. The ratio of admissions has also been very high in the Birmah, and that of the deaths in the Presidency and Hyderabad Circles.

Eruptive fevers did not prevail to any extent at any of the stations. In the Hyderabad Circle, in which the highest ratio of admissions by them occurred, the excess was due to 4 cases of small-pox in the 90th Regiment at Kamptee and Seetabuldee; a fatal case occurred also in the Royal Artillery at Kamptee. The other death by small-pox was that of a man of the 24th Regiment at the Depôt at Poonamallee. The men are all stated to have borne marks of vaccination.

Continued fevers.—The ratio of admissions was high among the troops on the march, from the occurrence of 22 cases in the 2nd Battalion 24th Regiment, but the numbers were very small, and the results, therefore, liable to irregularity. The admissions were high also in the Hyderabad and Rangoon circles, and the mortality in the former was considerably above the average. In the Hyderabad Circle the high ratio was caused by the occurrence of fever of the continued type in the 2nd Battalion 24th Regiment, 158 cases having been admitted from that corps, of which 8 terminated fatally, 7 of enteric, and 1 of typhus fever. In the Rangoon Circle the excess of cases was due to the admission of 108 of febricula in the 2nd Battalion 21st Regiment.

Paroxysmal fevers furnished a very high ratio of admissions in the Hyderabad Circle, the excess being most marked at Kamptee, where the ratio amounted to 455 per 1,000 of the strength; the A Battery D Brigade Royal Artillery furnished the highest ratio, the C Battery 14th the next, and the 90th Regiment had also a very high proportion of cases. The mortality was not excessive in any of the corps. The admissions by paroxysmal fevers were also high in the Birmah Circle, chiefly in the 5th Battery 5th Brigade Royal Artillery, and the 2nd Battalion 21st Regiment at Rangoon, and in the right wing of the 76th at Thayetmyo; the other batteries of Artillery at Rangoon, Thayetmyo, and Tonghoo, and the left wing of the 76th at the latter station had a comparatively small proportion of cases.

Malignant cholera prevailed to a considerable extent, and with the usual fatal results, in the Presidency, Birmah, and Hyderabad Circles, and in the latter a number of cases of *choleraic diarrhœa* were also returned.

In the Presidency Circle the cases amounted to 17, and 2 of choleraic diarrhœa, and the deaths to 11. They all occurred in the 45th Regiment, and, with the exception of 1 fatal case at St. Thomas's Mount, all at Fort St. George and Palaveram. The first case was admitted on the 3rd of September, cholera being at the time prevalent among the civil population, and died in ten hours. The next case occurred on the 7th September, and was followed by two on the 8th. On that date the two companies in which the disease had appeared were moved out to camp at Palaveram. The disease continued to prevail among the men till the 16th, when it ceased. There were no cases among the officers, the women, and the children.

In the Hyderabad Circle the disease prevailed at Kamptee, where there were 7 cases with 5 deaths, and 4 of choleraic diarrhœa with 2 deaths, and at Secunderabad, where 2 fatal cases of cholera and 9 cases of choleraic diarrhœa with 1 death occurred. At Kamptee cholera prevailed as an epidemic among the civil population from April to August. In April the Royal Artillery and 90th Regiment had each a fatal case; in May the Royal Artillery had 2 cases, of which 1 died, and the 90th had a fatal case; in August a volunteer from the 90th to the 45th, but who had not joined the latter corps, was attacked and died, and at the same time 2 cases of choleraic diarrhœa occurred, one in the Royal Artillery, and the other in the 90th Regiment, both of which proved fatal; in November a fatal case of cholera occurred in the C Battery 9th Brigade Royal Artillery, which had just arrived from England, and in that and the following month 2 cases of choleraic diarrhœa were admitted, both of which recovered. Four of the cases in the Royal Artillery are stated to have occurred in hospital, and 2 of them died. There were no cases among the officers, or the women and children. At Secunderabad there were 2 fatal cases, one in the

2nd Battalion 10th Regiment in April, and the other in the 2nd Battalion 24th in July. Nine cases of choleraic diarrhœa were reported, of which 1 proved fatal in the 10th Regiment. Cholera was prevailing as an epidemic in the district in June, July, and August. In the Birmah Circle there were 13 cases and 4 deaths; all the cases but one at Tonghoo, which recovered, occurred at Thayetmyo, in the right wing of the 76th Regiment; the Battery of Royal Artillery at the same station escaped without a case. The disease first broke out on the 9th of May, and before the end of the month 5 cases and 2 deaths occurred among the men; there was no case in June; 1 was admitted in July; there were 5 cases and 2 deaths in August, and 1 case was admitted in September. The case in July, and 3 of the cases in August, were patients in hospital under treatment for other diseases. There were no cases among the Officers, but there were 4 among the women, of which two proved fatal, and there was also a fatal case of choleraic diarrhœa, and among the children there were 6 cases of malignant cholera, all of them fatal. *Madras.*

Syphilis.—The very high ratio of admissions by this disease at the Depôts was the result, not of its prevalence there, but of the number of men labouring under secondary symptoms who were sent for change, or to be invalided. Of 105 admissions at Poonamallee 79, and of 44 at Wellington 36, were for the secondary forms of the disease. Omitting the Depôts and Troops on the March, the ratio of admissions was highest in the Hyderabad, and lowest in the Mysore, Circle. The ratio of admissions by syphilis—primary and secondary—per 1,000 of mean strength at each of the stations in the Command in 1868 and 1869 respectively, is shown in the following Table:—

Stations.	1868.	1869.	Stations.	1868.	1869.
Fort St. George and Palaveram ..	217·4	82·2	Bellary	147·9	149·3
St. Thomas's Mount..		125·8	Secunderabad ..	123·9	113·3
Trichinopoly.. ..	155·3	184·0	Kamptee	104·4	146·4
Bangalore	102·9	69·4	Seetabuldee.. ..	235·7	91·8
Cannanore	57·3	57·9	Thayetmyo	147·1	103·2
Calicut	65·8	34·2	Rangoon	265·5	137·6
Malleapooram ..	13·0	12·2	Tonghoo	83·3	28·0
			Port Blair	97·3	26·3

This Table shows an increase in the admissions at Trichinopoly and Kamptee, and a decrease at all the other stations except Cannanore and Bellary, where the ratio in the two years was nearly identical. Of the large stations the reduction was most marked at Rangoon. The high proportion of cases at many of the stations shows that there is ample scope for the operation of the Contagious Diseases Act, which, though introduced at many of them, has not yet had a fair trial, in consequence of the police arrangements not having been completed.

Scrofula, Phthisis, &c.—The ratio of admissions and deaths was high in the Presidency Circle; one of the deaths, however, was that of a man of the 76th Regiment who had been invalided from Birmah, and another that of a man of the 3rd Battalion 60th Regiment, *en route to join his* corps; the deaths, therefore, by these diseases among the troops serving in the Circle were only 3, or in the ratio of 1·85 per 1,000 of mean strength, and all occurred in the Royal Artillery at St. Thomas's Mount. The admissions at the Depôts were extremely high, but this was the result of the number of men labouring under phthisis who were sent to Poonamallee to appear before the Invaliding Board.

Anæmia.—The admissions under this head were unusually numerous, but, as already stated, the excess was confined to the 18th Hussars at Secunderabad, and attributed by the Medical Officer of the corps to the climate of that station.

Local Diseases.—The ratio of admissions and deaths by *diseases of the nervous system* was much above the average in the Hyderabad Circle, the former chiefly from the occurrence of a large number of cases of neuralgia at Secunderabad, not confined specially to any corps, and the latter from apoplexy and

Madras. sunstroke at Secunderabad and Kamptee. At the former station there were 3 deaths from apoplexy and 7 from sunstroke, and at the latter 5 were returned from apoplexy and 3 from sunstroke. In the aggregate the deaths from these two causes did not differ much from the results of the preceding year. At none of the stations can sunstroke be said to have been epidemic.

Diseases of the eyes did not prevail to any extent in any of the Circles; the proportion of cases was rather higher at Secunderabad and Bangalore than at the other stations, but in none of the corps was ophthalmia epidemic, nor was its prevalence so great as to require special notice.

Diseases of the circulatory system prevailed to nearly the same extent in all the Circles. Aneurism was the most fatal disease in this order, 12 of the 20 deaths having been caused by it.

Diseases of the digestive system were the most prevalent and fatal of the local diseases in all the Circles; omitting the Depôts, the ratio, both of admissions and deaths, was highest in the Hyderabad Circle. The most important diseases in this order, as regards both admissions and deaths, were dysentery, diarrhœa, and hepatitis; their relative prevalence and mortality at each of the principal stations in the Command is shown in the following Table:—

Stations.	Admitted.	Died.	Stations.	Admitted.	Died.
Fort St. George and Palaveram	104·5	3·52	Seetabuldee	193·5	..
St. Thomas's Mount	162·9	6·18	Chindwarrah	66·7	..
Trichinopoly	162·2	6·94	Rangoon	303·1	6·31
Bangalore	181·5	8·44	Thayetmyo	145·2	2·52
Cannanore	207·7	10·38	Tonghoo	152·6	..
Calicut	310·3	..	Port Blair	114·0	..
Malleapooram	195·1	..	Poonamallee	100·7	50·36
Bellary	172·4	4·62	Wellington	162·9	5·10
Secunderabad	370·0	15·55	Ramandroog	21·7	..
Kamptee	252·0	2·63	On the March	292·1	..

The very high ratio of deaths at Poonamallee was, of course, the result of the number of cases sent there for the purpose of being brought before the Invaliding Board. Of the large stations, Secunderabad furnished much the highest proportion of admissions and deaths; Cannanore furnished the next highest proportion of deaths, and the admissions were considerably above the average at Rangoon, Kamptee, and Cannanore.

Diseases of the urinary system were greatly in excess in the Presidency Circle, and they were also high in the Hyderabad Circle. The excess was due to the prevalence of gonorrhœa, in the former at all the stations, and in the latter particularly at Kamptee.

Debility.—The admissions under this head were numerous in the Presidency and Birmah Circles; in the former from the admission of 83 under that head in the 45th Regiment at Fort St. George, and in the latter from 72 cases in the 2nd Battalion 21st Regiment at Rangoon; they were attributed to the influence of the climate.

Poisons.—Considerable irregularity is shown in the admissions by this class, attributable, however, in some to a number of cases having been, through misapprehension, returned in it which, under the old classification, would have appeared as intemperance (*ebriositas*). The prevalence and mortality of *delirium tremens* in each of the Circles was as follows:—

Circle.	Admitted.	Died.	Ratio per 1,000 of Strength.	
			Admitted.	Died.
Presidency	32	3	19·7	1·85
Mysore	30	3	9·3	·93
Hyderabad	19	3	6·6	1·05
Birmah	31	1	18·2	·59
Depôts	4	..	15·4	..
On March	1	..	4·9	..

In addition to these deaths, two occurred from the direct effects of intoxication, one at the Depôt at Wellington, and the other at Tonghoo. The admissions for *delirium tremens* were considerably higher in the Presidency and Birmah than in the other Circles; in the former the highest proportion of cases occurred in the 2nd Battery 5th Brigade Royal Artillery, and in the latter in the 2nd Battalion 21st Regiment.

The admissions and deaths in each corps serving in the Command during the year are shown in the following Table :—

Madras.

Regiments.	Average Annual Strength.	Admitted into Hospital.	Deaths.			Annual Ratio per 1,000.		Stations during the Year.
			In India.	Of Invalids.	Total.	Admitted.	Died.	
CAVALRY.								
16th Lancers ..	466	450	10	1	11	965·7	23·60	Bangalore 12 months
18th Hussars ..	426	746	14	..	14	1,751·2	32·86	Secunderabad 12
Total Cavalry ..	892	1,196	24	1	25	1,340·8	28·02	
RL. ARTILLERY.								
D Brigade R.H.A.	579	1,150	16	2	18	1,986·2	31·09	A, Kamptee 12 B, Bellary 12 C, on the march $\frac{2}{3}$ „ Secunderabad $11\frac{1}{3}$ D, Secunderabad $2\frac{1}{3}$ „ Bangalore $9\frac{2}{3}$
5th Brigade R.A.	507	700	14	2	16	1,380·7	31·56	No. 1, Rangoon 12 No. 2, Madras 12 No. 3, Tonghoo 12 No. 4, St. Thomas's Mount 12 No. 5, Rangoon 12 No. 6, St. Thomas's Mount 12
9th „ „	54	113	3	..	3	2,092·6	55·55	Brigade arrived from England. A, St. Thomas's Mount $1\frac{1}{3}$ C, Kamptee $1\frac{2}{3}$ G, on the march 1 „ Secunderabad 1
14th „ „	325	566	13	..	13	1,741·5	40·00	A, Bangalore 10 B, Secunderabad $9\frac{1}{2}$ „ on the march $\frac{1}{2}$ C, Kamptee 10 Brigade embarked for England.
20th Brigade R.A.	662	860	19	2	21	1,299·1	31·72	A, Bellary 12 B, St. Thomas's Mount 10 „ Trichinopoly 2 C, Secunderabad 12 D, Cannanore 12 E, Kamptee 12
23rd „ „	669	784	17	..	17	1,171·9	25·41	A, Thayetmyo 12 B, St. Thomas's Mount 12 C, Secunderabad 10 „ Bangalore 2 D, Bangalore 12 E, Bellary $\frac{1}{3}$ „ On the march 1 „ Secunderabad $10\frac{2}{3}$
Total Rl. Artillery	2,796	4,173	82	6	88	1,492·5	31·47	

Regiments.	Average Annual Strength.	Admitted into Hospital.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Stations during the Year.
INFANTRY.								months.
1st Bn. 1st Foot	846	907	20	1	21	1,072·1	24·82	Cannanore 12; Detachments at Calicut, Mallcapooram, and Trichinopoly.
2nd „ 10th „ ..	698	713	11	8	19	1,021·5	27·22	Secunderabad 12
2nd „ 19th „ ..	717	650	6	1	7	906·6	9·76	Bangalore 11½; Embarked for Bengal.
2nd „ 21st „ ..	811	1,415	13	7	20	1,744·8	24·66	Rangoon 12
2nd „ 24th „ ..	713	1,125	31	2	33	1,577·8	46·28	On the march 1½; Secunderabad 10½
45th Foot ..	812	818	16	..	16	1,007·4	19·70	Madras 12
3rd Bn. 60th Foot	833	1,102	11	3	14	1,322·9	16·81	Bellary 12
76th Foot ..	452	824	11	2	13	1,823·0	28·76	Thayetmyo 12
„ Left Wing	243	212	2	..	2	872·4	8·23	Tonghoo 12
90th Foot ..	443	519	12	1	13	1,171·6	29·34	Kamptee 9; *En route* to England.
Total Infantry..	6,568	8,285	133	25	158	1,261·4	24·06	

The admissions and deaths were highest in the Artillery and lowest in the Infantry. In the Cavalry the sickness and mortality were highest in the 18th Hussars at Secunderabad. In the Royal Artillery, omitting the 9th Brigade, which arrived from England in November, the admissions were highest in the Royal Horse Artillery stationed at Bangalore, Kamptee, Secunderabad, and Bellary, and lowest in the 23rd Brigade at Thayetmyo, St. Thomas's Mount, Secunderabad, and Bangalore; the mortality, also, was lowest in the 23rd Brigade, and it was highest in the 14th, stationed at Bangalore, Kamptee, and Secunderabad. In the Infantry the admissions were highest in the right wing of the 76th Regiment at Thayetmyo, and in the 2nd Battalion 21st at Rangoon, and lowest in the left wing of the 76th at Tonghoo, and the 2nd Battalion 19th at Bangalore; the mortality, also, was lowest in the two last-named corps, and it was highest in the 2nd Battalion 24th Regiment at Secunderabad.

SANITARY REPORT.

Inspector-General Hadaway makes the following remarks in his Sanitary Report on the state of health of the European troops serving in the Presidency of Madras :—

Madras.—The climate during the past year has been exceptional, as regards the unusually high temperature, and the rainfall, which has been not only very deficient, but has been distributed over a long period. The so-called wet, or N.E., monsoon, during which the chief portion of the year's rain is received, instead of lasting as usual from the middle of October to the end of November, extended on to the end of December. It was consequently exceptionally intermitting in its occurrence, and succeeded as it was in its intervals by hot sunny days and cold nights, caused the climate of the last 2½ months of the year to be characterized by frequent, great, and sudden transitions of temperature, influences so inimical to health in this country. Climate.

Madras. *Bangalore.*—Climate during the year has been characterized by a rainfall below the average, and an unusually protracted and trying hot season.

Secunderabad.—From March to October the maximum temperature exceeded that of 1868, and several previous years. The rainfall in these eight months amounted to 30 inches against 23 in 1868.

Kamptee.—The temperature during the hot months was exceptionally high, and the rainy season, which was much protracted, was preceded by much distressing sultriness.

Burmah.—1869 was exceptionally trying, much more so than 1868. The rainfall was irregular and partial, and heat at times excessive. Cholera appeared in Thayetmyo in May, July, and September.

Neilgherry Hills.—The rainfall at the close of the year was very greatly above the average; torrents of it descended for days and days together. This inordinate rainfall had no material effect upon the health of the troops at Wellington.

Cholera.—There was a large increase in the annual ratio per 1,000 of admissions and deaths from this disease over the past two years.

Small-pox has not prevailed epidemically. Vaccination was most strictly carried out, and stringent orders issued that every camp follower, including their wives and children, who live in regimental bazaars or lines must bear distinct marks of vaccination or small-pox.

Mortality.—The death-rate per 1,000 of strength has been higher during the past year than for the previous eight years, and this is accounted for by the number of deaths from cholera that occurred.

Barracks. *Depôt, Poonamallee.*—In my last year's Report I noted that all repairs and improvements to these barracks had been stopped, by order of Government, in their proceedings, No. 2352, of 16th June, 1868, in consequence of the contemplated removal of the Invalid Depôt to the proposed new Marine Sanitarium at Ennore, 12 miles north of Madras. No steps have at present been taken, so far as I am aware, to buy either houses or erect barracks; but I still hope that in the course of time the Depôt will be removed there. Surgeon Carter remarks "the barracks are ill-suited for men in health, much more so are they "for the men composing this Depôt: they have been condemned, and no great "improvement will be undertaken. These matters have been so frequently "alluded to, that it is needless to recount how defective these buildings are in "every respect; the heat is almost intolerable in the hot weather; the "buildings low, tiled, and the contiguity of the opposite ranges prevents "perflation or good ventilation."

The barrack accommodaton at the other stations in this circle, viz., Fort St. George, St. Thomas' Mount, Trichinopoly, and Wellington, continue the same as last year, and no changes are reported.

Mysore Circle.—The remarks in my Report last year are still applicable to the present as regards the objectionable plan of construction of most of the barracks in the Mysore Circle; there has been no change, nor can any change be looked for until new barracks become necessary. The attention of the divisional authorities has been called to the improvement of the accommodation in existing barracks, in minor details. The new barracks for the Royal Horse Artillery at Bellary, though sanctioned, have not been commenced. The battery of Foot Artillery at the same station continues to occupy the old condemned hospital at Bangalore; the drivers of one battery still occupy the condemned barrack adjoining the old graveyard, but their occupation of it will shortly cease, as the new block on the race-course, containing the recreation rooms and the Serjeants' mess-room for the cavalry regiment, is almost complete; and on its being handed over, another block of the Race-course Barracks will be transferred to the Royal Artillery. No alterations have been made as regards the ridge ventilation in the new Barracks at Cannanore, and the same objection to it still exists, viz., the excessive rainfall on that coast. Dr. Barclay writes, "Finding at my last inspection that in the old "infantry Barracks, which possess ridge ventilation, the openings had been "blocked up, I brought the subject to the notice of the Brigadier Commanding, "and suggested the substitution of perforated metallic plates on the windward "side, to be removed at the termination of the monsoon; but the Engineer "Officer represented that such plates were not procurable, and stated that the

"deals in use, which are removed after the monsoon, being perforated by "numerous holes ¼ of an inch in diameter were sufficient for every purpose. "He added further, that ridge ventilation was not considered suitable for "buildings on the west coast, owing to the severity of the monsoon rains "there, and that the permeable description of roof employed, viz., curved tiles "without anything under them afforded ventilation enough." *Madras.*

Secunderabad.—Much correspondence has taken place with reference to the insalubrity of the old Infantry barracks, occupied by the 18th Hussars; and towards the end of the year it was deemed advisable to send them out of the cantonment into camp, and to prohibit men coming into the station at all; the move had the desired effect, and after remaining in camp, which was shifted occasionally, about six weeks, the men returned in greatly improved health, so that whatever may have been the cause or causes of so much sickness in the regiment, they did not obtain while the men were living under canvas.

Trimulgherry.—The following statement includes the barrack accommodation completed and handed over for occupation to the Royal Artillery and the two Infantry Regiments quartered in North and South Trimulgherry during the year 1869. It also includes the barracks and subsidiary buildings under construction on the 31st December for these branches of the Service, together with a return of buildings not yet commenced—amongst these are two double-storied barracks for European Cavalry, the materials for which are now being collected.*

Kamptee.—The new barracks that were commenced in 1867, and never completed, are in *statu quo*; nor does there seem any prospect of their ever being completed. The old barracks have long since been condemned. It was in contemplation to reduce the European force of Artillery at Kamptee, but nothing has been heard of this lately.

Rangoon.—The barracks are old, but in tolerable repair. It is contemplated building barracks on the present site, partly of brick, with an upper story of wood.

St. Thomas' Mount.—The hospital accommodation is sufficient. Surgeon-Major Fasson remarks on the advisability of removing the high wall that goes all round the compound; but the Government are not likely to sanction any expenditure, except such as is absolutely necessary. The building itself was never intended for an hospital. The new female hospital referred to last year has been completed and given over to the Medical Officer. *Hospitals.*

Poonamallee.—No changes or improvements have taken place since last Report. The remarks of last year—"there were never such unsuitable buildings "for barracks or hospitals," continue to apply, and will, I suppose, until the depôt is removed to Ennore.

Wellington.—Dr. Cowen writes, "Inconvenience has at times been greatly "felt at the scanty accommodation for the women and children, and the want "of a proper ward for labour cases, which are compelled to be mixed up in the "general room. It was hoped that representations and the personal inspection "of his Excellency the Governor, and his Excellency the Commander-in-Chief, "and the Heads of the Medical Department, would have led to extra "accommodation being provided, but financial reasons have prevented any "measures being adopted; meantime, should necessity arise, it has been decided "to utilise a part of the married quarters."

A shed for meteorological instruments is in course of construction, and will be completed during the ensuing year.

Bangalore.—During the year, the two new pavilions on the race-course have been taken into use; one by the 16th Lancers, the other by the Royal Artillery. The accommodation is reported as being *unexceptionable* in quality, and more than ample in amount. The barracks are built of granite throughout, and efficiently ventilated.

The alterations on the north-western block of detached wards for contagious diseases have been completed. The block now contains three large rooms with fair through ventilation. The two blocks of detached wards, which

* It has not been considered necessary to print the statement affording these details.

Madras. fortunately have not as yet been required for the accommodation of any cases of contagious disease, are at present used as female hospitals, pending the opening of the garrison female hospital in the admirable pavilion constructed for that purpose, and for the opening of which Government sanction has not been received. With the exception of the floors, which are of chunam, Dr. Barclay writes, "the building is in every way most excellent, and admirably adapted for the purpose for which it is intended."

Bellary.—The accommodation is the same. A new female hospital will shortly be ready, which will give increased accommodation to the men, and has the further advantage of being on a separate site, whereas now they occupy one end of the male hospital.

The other hospitals in this circle have undergone no material change.

Secunderabad.—There has been no addition to the hospital accommodation during the year. The sites for the Royal Artillery and Cavalry hospitals have been selected; but the buildings have not been commenced.

The site for the 1st European Infantry Hospital has not been selected.

Kamptee.—During the past year, an open terraced verandah, 11½ feet wide, raised to the same level as the wards, has been added the whole length of these buildings; and though not completed in time to admit of any difference in temperature being noted, yet from, in a great measure, keeping the sun off the Kuss Kuss Tattees, it will doubtless assist in allowing a lower temperature to be obtained.

The following improvements have also been made:—1, a new surgery; 2, a temporary building, with thatched roof and stone floor, for cholera or small pox cases; 3, the main drain from lavatory relaid and flagged; 4, six windows between main ward and verandah of women's hospital have been converted into doors, improving the ventilation; 5, additional window in lying-in ward, and three other windows glazed instead of shutters; 6, sunshades to windows, women's hospital; 7, tiled verandah length of building on south-west side, women's hospital added; 8, porches on posts with flat terraced roofs added outside doorways of new hospital on east side; 9, drainage improved at back of hospital by reducing the level; 10, a new well for Royal Artillery and Infantry, good water and ample for all purposes; 11, a temporary building as an hospital for treatment of native followers, with thatched roof and flagged floor.

Burmah Circle.—No alterations or changes are reported.

Lavatories, &c. *Poonamallee.*—Like the barracks and hospital buildings at this station, the lavatories also are of the poorest description, and the Surgeon remarks: "There is a plunge bath much resorted to, 23 feet by 15 feet, filled to a "depth of 4½ feet twice a week." There are no bathing parades, there being no place available. I consider the means at the disposal of the men are not sufficient for cleanliness and comfort in this country, though he writes previously: "In all these (*i.e.*, lavatories) there is a sufficiency of tubs and washing basins."

St. Thomas's Mount.—The bath and ablution accommodation have been defective in so far that an insufficient supply of water prevented the plunge bath being used during the latter months of the year, and as a consequence, it became necessary to have bathing parades in the River Adyar for two days in the week. This river runs within about a quarter of a mile of the back of the barracks, and is much resorted to by men for this purpose.

Wellington.—A screen wall has been erected between back of barracks and bath to shut out the the bathers from sight.

Bangalore.—With the exception of a second lavatory for the Royal Horse Artillery, no new lavatories have been built at Bangalore during the year. Those attached to the Race Course Barracks have been considerably improved by their floors being covered with asphalte, and cisterns for the refuse water (from which it is removed daily) being constructed. The splendid plunge baths, which have long been complete cannot be taken into use, until the Ulsoor Waterworks are more efficient.

Bellary.—The new lavatories, one for each block of the barracks, are complete and in use. The supply of water for this purpose is scanty on account of the long-continued dryness of the weather, extending over the last three years; during this year only 11·62 inches of rain fell, and that was extended

over 52 days. It is in contemplation to bring water from a tank into Bellary for bathing purposes, but it is very questionable if it will answer. A new plunge bath for the Royal Horse Artillery, in course of construction, is to be dependent for its supply on the success of this scheme. *Madras.*

Cannanore.—The new lavatories for the Infantry have been for some time completed and in use. They contain neither baths nor separate accommodation. Plunge baths have not been provided. Bathing in the sea is enforced twice a week.

Secunderabad.—Sufficient and sufficiently used in barracks, but still limited as regards water supply in the large Trimulgherry Hospitals.

Kamptee.—There is a large swimming bath, common to all the batteries, with a portion partitioned off for the use of women.

The lavatories are good, with ample means of ablution, and good water supply.

Rangoon.—A separate ablution house, with private bath rooms, is attached to each bungalow, well supplied with tubs, water, and basins.

Thayetmyo, Tonghoo, and Port Blair.—The arrangements for bathing, &c., are pronounced satisfactory.

Kitchens provided with cooking ranges are still the exception, the cooking being for the most part done over open fire-places of the old native fashion, and it is understood that no more ranges are to be supplied, the Government of India having decided that open fire places, lined with iron, are preferable. Cooking can certainly be very well done on such fire-places, but if iron partitions more than a few inches in height be put up between each two of them, as is likely enough to be done in the new-pattern kitchen, their virtue will be lost in the eyes of the native cooks, as these individuals regulate the heat to which their dishes are exposed by using brieks of different sizes as rests for the cooking pots. Cleanliness in the culinary operations is ensured as far as possible by European supervision. Cooking.

Wellington.—No change in quantity. The Medical Officer writes: "the "mutton generally good, and at times excellent; the beef has certainly improved "under a new system of feeding and killing, established 1st April, 1869, by "the Commissariat Department; bread fair; vegetables abundant, but might "be of a better quality." Rations.

Poonamallee.—Meat generally of good quality. Beef five and mutton two days a week. "Bread," the Medical Officer writes, "is the best he has seen "in the country," although he considers it inferior to what he has seen in Bengal. There is a great scarcity of vegetables and fruit.

St. Thomas's Mount.—The Surgeon considers these of fair quality, and to have been sufficiently varied.

Trichinopoly.—Meat and bread of fair quality; vegetables vary in quality and quantity according to season.

Mysore Circle.—No change has taken place in the constitution of the rations, except at Bellary and Ramandroog, where in consequence of the occurrence of a few well-marked cases of scurvy, and of a more general scorbutic tendency among the men of the 3rd Battalion 60th Rifles, and the Royal Artillery, His Excellency the Commander-in-Chief approved of the suggestion that the old constitution of the vegetable rations (12 oz. potatoes, and 4 oz. mixed vegetables) should be reverted to as an experimental measure for six months. The result was so satisfactory, the men appreciating the change and consuming the whole of the rations with marked benefit to their health, that the altered proportions were ordered to be permanently issued at these stations.

The meat ration for the most part continues to be favourably reported of; the beef as a general rule being stated to be better than the mutton.

Nothing has been done during the year towards the introduction of the most important improvement of all, and that which alone will ever secure the supply of really good meat to the troops, viz.: stall-feeding the animals for a reasonable time before killing them.

The Government bakery at Bangalore is now in full action, and there is consequently absolute security against intentional adulteration.

Secunderabad.—Very few complaints have been made during the past year, the supplies generally have been of good quality. But the variety of vege-

Madras. tables is still a desideratum. Potatoes form a part of the vegetable ration from October to April, and there is no reason why the soldier should not have a greater variety of vegetables from August to April, when vegetables are readily raised at this station. *Bread.*—A Government bakery is now under construction.

Kamptee.—There does not appear to have been any improvement in the vegetable supply which was noted in last year's Report.

Burmah Circle.—The rations have been good; a few complaints have been made of the quality of the bread, but much pains is taken by the Commissariat Department to supply food of as good quality as the nature of the country will admit of. The beef, the almost invariable description of meat, is of fairly good quality. Mutton is issued but twice a year, Christmas and New Year's day, as the climate is inimical to sheep. It is given every second day to the sick, and the supply is procured (gram fed, I believe) from Bengal. Salt meat and pickles are issued twice a month. Fresh potatoes are issued with greater frequency than hitherto to the men, and when not procurable are supplemented by preserved or sweet potatoes and yams, knowkoll or pumpkins, and occasionally cabbages.

Clothing and Bedding. The only change in the clothing of the men, during the year, has been the issuing of the serge coat to all the Artillery, sanctioned during 1868.

The clothing of the men is sufficiently varied, and the description worn regulated carefully according to the seasons at the various stations.

Iron cots are gradually taking the place of boards and trestles, and every man is now furnished with a straw mattress, 20 lbs. in each, changed every three months. Pillows only are not supplied to the soldier; these he has to provide himself. This has been brought to notice both by the medical and military authorities, but at present, so far as I am aware, no steps have been taken to supply the deficiency.

Duties. Care has invariably been taken to protect all branches of the Service from unnecessary exposure to the sun. The duties have been of the usual description, and not of more than average severity, and they are generally reported to have been productive of no injurious effect on the general health, except that Dr. Shelton writes: "the temptation to irregularities at Rangoon are so great "as to render picket duty necessary from 6 to 11 P.M. This in the rains "exercises a decidedly bad effect on health, but a representation to this effect "to the Major-General brought for answer that the ends of discipline abso-"lutely required it."

The average number of nights in bed is never less than four; and whenever it falls below that number, the attention of the military authorities is immediately called to the fact, and the duties in some way or other lessened.

It is to the injurious effect of night duties, and the great vicissitudes of temperature, that much of the sickness in India is attributable, and after the exhausting influence of the heat by day, the restoring influence of rest and sleep by night is absolutely necessary.

Every regiment possesses a reading-room, supplied with books, papers, and periodicals, and other sources of amusement—as bagatelle, back-gammon, chess, drafts, &c. These rooms are much resorted to and highly appreciated by the men. In Her Majesty's 45th Regiment, in Fort St. George, they have weekly penny readings, which is joined in by both men and officers, and always bring a full house. One night is reserved, I believe, exclusively for the men and women of the regiment; the second night is open to the public.

Employment, Amusements, Gymnastics. Every regiment has not its own workshop; but I believe every regiment has been, or will be, supplied with tools.

There was an exhibition here in Madras, in November last, of articles of soldiers' and soldiers' wives' own workmanship. The exhibition was got up by that much lamented officer, Colonel Robertson, the late Adjutant-General of the Madras Army. Many of the articles exhibited proved that they were no unskilled hands that made them. For further information regarding workshops I would refer you to the remarks by the Administrative and Executive Medical Officers. I quite agree with the remarks by Dr. A. Barclay, Deputy Inspector-General, at page 76 of his Report, that "what is "required is not so much the production of good work by men who are already "skilled tradesmen or artisans, as the employment of such men in teaching

" their trades to young soldiers who have none; but that is done to a very " limited extent, if at all." *Madras.*

The far more general employment of soldiers in Government work, I am satisfied, would be greatly for the advantage of both parties: and here I would take the opportunity of calling attention to the great advantages that appear to have been derived by the locating of men in the hills in Bengal, and employing them in making roads, &c., &c.

Gardening continues to be carried out at some stations, but it does not add very largely to the vegetable supply. I believe that the Commissariat Department would willingly purchase vegetables from the soldiers, but many causes militate against the generality of the men taking much trouble with their gardens—laziness, and, in many of our plains stations and Birmah, lassitude and the uncertainty of their stay in any place; and lastly, though not least, the feeling that they may sow and others reap.

The usual out-door games are freely engaged in everywhere—cricket, football, fives, skittles, quoits, &c.

Gymnastics.—There is nothing favourable to report on this means of exercise. Very few gymnasia exist; and, from the evidence of former years, it is much to be regretted that those in existence are not kept up, and that more are not established; but without trained and paid instructors it is not to be expected that they can be conducted permanently in a satisfactory manner.

Since the adoption of the new nomenclature of diseases on the 1st of January, 1869, which has done away with the term, "Ebriositas," under which head the Medical Officers always returned men admitted into hospital suffering from the effects of alcohol not amounting to delirium tremens, it is *impossible* from the returns to give any statistics illustrative of the prevalence of intemperance. The terms under which intemperance is now returned are such as dyspepsia, febricula, &c., which may or may not be the result of excess. Intemperance.

I give the following extracts from some of the Administrative and Executive Medical Officers' Reports, who have better opportunities than myself of judging of the amount of sickness and invaliding that has occurred during the year from the abuse of alcoholic stimulants.

Wellington.—"Although actually only 33 cases admitted into hospital have " been traced to the direct and indirect influence of indulgence in liquor," says Surgeon-Major Cowen, "yet I have but little hesitation in stating that " almost every case of dyspepsia, some of fever, and many of cephalalgia, have " been either induced or aggravated by intemperance."

St. Thomas's Mount.—Surgeon-Major Fasson, Royal Artillery, remarks:—" I am more than ever impressed with the belief that intemperance prevails to " a considerable extent. Several of the cases admitted into hospital have " directly resulted from this cause, while many others have been indirectly " traceable to its effects; for, independent of the hepatic affections admitted, of " which intemperance in too many instances may be assigned as a predisposing " cause, it is to this one that a large proportion of the admissions from disease " of the enthetic order may be indirectly credited."

Poonamallee.—Staff-Surgeon Carter reports:—" It is not the above drinks " (referring to those supplied to the canteens) that prove injurious to the men, " but they have great facilities in procuring a vile spirit, the fermented juice " of the different palms, which costs but little and satisfies the unnatural desire " for drink which abounds not only amongst the invalids and convalescents, but " amongst a great many of the pensioners who reside here."

Trichinopoly.—Staff Assistant-Surgeon Lyne says:—" There seems to be a " good deal of intemperance among the troops stationed here, owing to the " cheap and bad liquor sold in the Bazaar."

Mysore Circle.—Deputy Inspector-General Barclay adverts to the subject:—" It must," he fears, "be stated that there has been no material diminution in " the amount of intemperance in the Circle, and that a large proportion of the " admissions into hospital have been due to it, as well as nearly all the crime."

Hyderabad Circle.—" As a general rule, any command of money," remarks Surgeon-Major Gibbons, "will almost necessarily bring about more or less " intemperance under any circumstances, but where the facilities for procuring " spirituous liquors are so great and numerous as in Secunderabad, the vice is " not to be wondered at. * * * * * In short there is

Madras. "very little difficulty for a soldier to procure any amount of liquor he can pay "for from either within or without the limits of the camp."

Brimah Circle.—Surgeon-Major Shelton says:—"I regret to record 31 "cases of *delirium tremens*, half of which number occurred in the 2nd Battalion "of the 21st Regiment at Rangoon, where great facilities for obtaining a "poisonous spirituous concoction exist."

Drainage. *Presidency Circle.*—In the Presidency Circle there are no reports about inefficient drainage. At Poonamallee it was reported as defective, but no improvements have or are likely to take place.

Mysore Circle.—Dr. Barclay remarks:—"As to the drainage in the circle, "there is little to add to the remarks on the subject in the report for last year. "On the Race-course plateau and at Bangalore, cisterns of sufficient size to "contain the refuse ablution water have been constructed outside each ablution "room, and the water is removed in carts as often as is necessary. This is "only a temporary expedient pending the construction of some system of "drainage, but it has effected an immense improvement in the condition of "the bath-rooms and their vicinity.

"The large saucer-shaped granite drains between the ranges of barracks at "Bellary have been completed; and if the station were fortunate enough to be "visited by heavy rain, they would, no doubt, be of service for carrying off the "storm water; but it appears to be by no means certain that they would carry "it off in the desired direction, for Surgeon Young, 3rd Battalion 60th Rifles, "reports that their level is so inaccurate, that the water from the ablution "rooms will not run off by them, and has to be swept away daily. So far "as my experience of drains in India goes, this is not an unusual state of "affairs.

"The drain behind the married quarter for the Artillery at Cannanore, "which is open in part of its course and in part covered, was several times "reported as being very offensive during the year. No doubt it has been used "as a receptacle for other matters than refuse ablution water, as covered "drains in India always are. Certain alterations on it have been recommended, "but not yet carried out.

"There is nothing else to note as to the drainage at Cannanore, or at its "dependent outposts."

Secunderabad.—Whatever may have been the amount of attention and consideration given to the representations of Administrative and Executive Medical Officers on this vitally-important subject of drainage since 1867, the results have been so small that a system of efficient and thorough drainage is still loudly called for. The site of the new cantonment has now been more or less occupied since 1854, at first only by labourers employed in building, and an increased surface pollution has been going on ever since. Every succeeding year adds to the evil, and increases the dangers to be apprehended from trusting almost solely to the natural drainage of the position. Correspondence on this subject was forwarded with my last Annual Report, and much has subsequently taken place.

For sanitary reasons, all the Medical Officers are of opinion that, however good the natural drainage may be, the surface of the new cantonment has been changed by the numerous inhabited buildings. Hundreds of gallons of sewage are daily poured over that surface in addition to the rainfall, which alone previously fell upon it.

Adequate drainage is a sanitary necessity, the immediate carrying out of which ought to be decided on purely medical grounds, because the present sources of the water are inseparably connected with the drainage, and will remain so. An important advantage to health was anticipated in the distribution of the European forces on the elevated plateau of Trimulgherry. With the exception of Her Majesty's 18th Hussars and a few men of the Heavy Field Battery of Artillery, all the troops during the past year have occupied the magnificent new barracks—perhaps the finest in India as regards themselves. Now, however, there is only one more unhealthy station in India, Kamptee, and all the lavish expenditure in these barracks is believed to have been neutralized in a very great degree by total neglect of proper artificial drainage from the date of occupation.

Kamptee.—From this station there are no remarks about the drainage; and

last year the report was satisfactory on the whole, only one slight cause of complaint which has probably been remedied, as it is not referred to again. *Madras.*

Birmah Circle; Rangoon.—The barrack square, before wet and irregular, is now levelled and dry. The drains are good, of brick. A low-lying swamp to the north-east of the barracks is being converted into a reservoir by means of bunds, and an ample supply of water, and bathing place for the men will thus be secured.

Thayetmyo.—The ground on which the barracks are built is about 45 feet above the low-water level. Though pleasantly situated close to the bank of the river, which discloses clean sand at low-water level, and *though well drained*, it cannot be said to be healthy.

Though many sanitary improvements have taken place during the year, including the occupation of the new buildings on the Race-course plateau at Bangalore, the establishment of a new female hospital for the three corps at that station, and the completion of a new female hospital at St. Thomas's Mount, now open, I would beg to call attention to the following :— Improvements required.

1. The very urgent necessity for establishing a complete system of drainage around the new barracks at Trimulgherry. This has again and again been brought to notice, and the last reply received from the Quartermaster-General's Department was, that it was not likely to be commenced until the completion the new Cavalry barracks at Trimulgherry, some two or three years hence; and now, while I am writing, information has reached me that these barracks are not likely to be finished for eight or ten years to come, in consequence of some of the materials sent from England (iron girders, I believe, for the roof) not being suitable, and that the old barracks at Secunderbad are to be put in thorough repair in consequence. The drainage of these splendid barracks is a matter which I consider of the greatest importance as regards the health of the troops.

2. Last year, and the year previous, I called attention to the desirability of the universal adoption of the dry earth system of conservancy in all the latrines, both in barracks and hospitals, throughout the Presidency; and wherever the latrines have been altered, and the system carried out in its entirety, it is spoken of most highly by all, but there are still in use in many barrack latrines the old bucket and plank, the former tarred twice a month, and in these dry earth is also used.

3. I also recommended the universal supply of cooking ranges; I understand no more are to be supplied, the Government of India having decided that open fire-places, lined with iron, are preferable: in this opinion I cannot concur, as my experience convinces me that where the ranges are in use, the rations are better cooked, and there should be a vast saving to Government in the expenditure of fuel, as the ranges do not require half the amount of fuel the open fire-places do.

4. Referring to the Proceedings of Government, marginally noted,* I beg to record my opinion that I still consider it desirable that a sanitarium should be built at Nyounjoe (Mount Joy), on the Arracan Hills, for the troops stationed at Thayetmyo; that the trial given to the place in 1869, was but for a very brief period, shorter indeed than was intended, for Dr. Shelton, in his Report, says, "yet the invalids did not leave Thayetmyo till 3rd March, instead of on "the 10th February. This loss of time has militated in no small degree in "making a fair estimate of the advantages expected" and he goes on to say in paragraph 8, "although there was no remarkable change in the physique "of the men, owing to the shortness of the time of their hill residence, the "Medical Officer reports that they enjoyed good health, while other men, who "remained at Thayetmyo, and who arrived from England about the same "time, sickened." Dr. Shelton, in the concluding paragraph of his report, writes, "I consider that the advantages, as far as can be gathered, which "have accrued to the men from the too limited period of their stay, have not "fallen short of what was anticipated."

5. Again referring to the P. M. G., No. 2352, of 16th June, 1868, I regret that the present state of the Financial Department has not permitted of any steps being taken towards transferring the Invalid Depôt from

Madras. Poonamallee to Ennore, this is much to be regretted, and the more so, as by the order above quoted, all repairs at Poonamallee have been stopped. This transfer of the Depôt, it is to be hoped, will shortly take place, as the buildings used as barracks and hospitals at Poonamallee are most objectionable on account of their being so low and badly ventilated; in fact they were never intended for the purposes for which they are now used.

Lastly, when Principal Medical Officer of the British Troops in the Bombay Presidency, in one of my annual reports, I strongly urged the question of the great benefit likely to be derived by the location of the European Troops as much as possible at hill stations. Most medical men who have had experience of hill stations are generally of opinion that little benefit is to be derived from the removal to the hill sanitaria of men whose health has been injured, and their constitution impaired, by a long residence on the plains, or by the effects of diseases contracted there; on the other hand, it is admitted that could Europeans on their first arrival in this country be quartered in well-selected, elevated stations, out of the prevalence of hot winds and the miasmatic influence of the plains, their general state of health would be very much better, as there would be a total immunity from some of the diseases peculiar to the plains. For anything to decrease the mortality of the troops, would not only be highly desirable on the score of humanity, but would be a very considerable saving to the public in a financial point of view, more especially as the extension of railways will render the carriage of necessaries towards hill stations much less expensive than it has hitherto been, and I am still decidedly of opinion that hill stations for the troops, as far as they possibly can be carried out, and sea sanitaria for the sick, are the great desiderata for India.

III. Bombay.

Bombay. The average strength of the European troops in the Bombay Command during the year was 10,538; the admissions into hospital were 16,096, and the deaths, including 10 among invalids sent to England, were 236. These numbers give the proportion of 1,527 admissions and 22·40 deaths per 1,000 of mean strength, both much higher than in 1868, but the former corresponding very closely with, and the latter 1·18 below, the average of the last nine years.

The diseases by which the sickness and mortality were caused are stated in detail in Abstract No. 23 in the Appendix, from which the following classified Summary has been framed:—

Order.	Diseases.	1869. Strength, 10,538. Admissions.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.
	I. *General Diseases.*						
1	Febrile Group	7,256	88	..	88	688·6	8·35
2	Constitutional „	1,781	19	3	22	169·0	2·09
	II. *Local Diseases.*						
	Diseases of the—						
1	Nervous System	233	31	1	32	22·1	3·04
2	Eye	397	..	..	..	37·7	..
3	Ear	63	..	..	..	6·0	..
4	Nose	8	..	..	..	·7	..
5	Circulatory System	160	11	1	12	15·2	1·14
6	Absorbent „	240	..	..	..	22·8	..
8	Respiratory „	503	9	3	12	47·7	1·14
9	Digestive „	2,420	38	1	39	229·6	3·70
10	Urinary „	739	4	1	5	70·1	·47
11	Generative „	124	..	..	..	11 8	..
12	Organs of Locomotion.. ..	37	..	..	..	3·5	..
13	Cellular Tissue..	196	..	..	..	18·6	..
14	Cutaneous System	780	1	..	1	74·0	·10
	III. *Conditions, &c.*						
	Debility..	100	..	..	..	9·5	..
	IV. *Poisons*	133	5	..	5	12·6	·47
	V. *Injuries.*						
2	Accidental	918	7	..	7	87·1	·66
3	Homicidal	4	1	..	1	·4	·10
4	Self-inflicted	1	11	..	11	·1	1·04
6	Judicial..	..	1	..	1	..	·10
	VI. *Surgical Operations*..	2	..	..	..	·2	..
	No appreciable Disease ..	1	..	..	..	·1	..
	Total	16,096	226	10	236	1527·4	22·40
	Average of 9 years, 1860–8 ..	..	..	..	..	1521·7	22·60

GENERAL DISEASES furnished upwards of half the admissions into hospital and nearly half the deaths; four-fifths of the cases were of the febrile, and one-fifth of the constitutional group. The following Table shows the influence of the principal diseases of this class upon the sickness and mortality :—

Bombay.

General Diseases.	Admitted.	Died.	Ratio per 1,000 of Strength. 1869. Admitted.	1869. Died.	1860–68. Admitted.	1860–68. Died.
Febrile—						
Eruptive Fevers	21	1	2·0	·10	1·6	·17
Continued „	1,428	14	135·5	1·32	84·3	1·17
Paroxysmal „	5,689	16	539·9	1·51	439·2	1·68
Malignant Cholera..	81	55	7·7	5·22	7·7	4·85
Choleraic Diarrhœa	10	1	·9	·10	..	..
Influenza	18	..	1·7	..	5·3	..
Erysipelas	6	..	·6	..	1·4	..
Other Diseases of this group ..	3	1	·3	·10	..	..
Constitutional—						
Rheumatism.	447	2	42·4	·19	57·4	·02
Syphilis	1,053	3	99·9	·29	120·1	·26
Scrofula, Phthisis, &c.	130	17	12·3	1·61	10·1	1·97
Scurvy and Purpura	15	..	1·4	..	3·7	·04
Anæmia	129	..	12·2	..	4·3	·04
Other Diseases of this group ..	7	...	·7	..	..	..

Eruptive fevers did not prevail to an unusual extent in the Command. Of the 21 admissions, 16, including the only fatal case, were by small-pox, and in all of them the men bore satisfactory marks of vaccination.

Continued fevers were more than thrice, and *paroxysmal fevers* were twice as prevalent as in 1868, and the admissions were considerably above the average of the last nine years, though without a corresponding increase in the mortality. This increased prevalence was attributed by the Medical Officers to the rainfall having been greater than usual.

The admissions by *malignant cholera* amounted to exactly the average of the preceding nine years, but the deaths were a little above it, 2 out of every 3 cases having terminated fatally.

Syphilis furnished exactly the same proportion of cases as in 1868, but the ratio was one-sixth under the average of the last nine years. There was a slight increase in the cases and decrease in the deaths by *scrofula* and *phthisis*, and an increase in the cases of *anœmia*, the latter probably due to the great prevalence of paroxysmal fevers.

Local Diseases.—Those of the *digestive system* were much the most prevalent and also the most fatal. Dysentery, diarrhœa, and hepatitis were the causes of three-fifths of the admissions and nearly four-fifths of the deaths by this group. Compared with 1868 there has been an increase in the admissions by dysentery and diarrhœa to the extent of one-third, but with a very trifling addition to the mortality, while there has been but a very slight increase in the cases of hepatitis, and the deaths by it amounted to only three-fifths of the ratio of the preceding year.

Diseases of the nervous system rank next in point of mortality, the deaths by them having amounted to 32, or 3·04 per 1,000 of strength. Seventeen of the deaths were the result of sunstroke, and 10 of apoplexy.

The high ratio of admissions by *diseases of the urinary system* was due to gonorrhœa which contributed six-sevenths of the cases in this order.

The admissions by *ophthalmia* were in the ratio of 35·3 per 1,000 of strength, being very slightly in excess of the ratio in 1868, but considerably under the average of the last ten years.

Poisons.—Under this class 71 cases and 5 deaths of *delirium tremens* were returned, 61 of alcoholic poisoning, probably some of those cases which were formerly returned as intemperance (*ebriositas*), and one of the sting of

an insect. The admissions by *delirium tremens* were one-fifth, and the deaths one-half, higher than the ratio in the preceding year.

INJURIES.—The suicidal deaths were 11 in number, or 1·04 per 1,000 of the strength, being more than double the average proportion in this Command. Seven were effected by gunshot wounds, one by cut-throat, one by hanging, and two by drowning.

The following Table shows the sickness and mortality at each of the principal stations in the Command :—

Military Divisions.	Stations.	Average Annual Strength.	Admitted into Hospital.	Died in India.	Ratio per 1,000.			
					Admitted.	Died.	Average of 6 Years. Admitted.	Died.
Presidency ..	Colaba	525	390	4	742·9	7·62	1442·4	19·62
Poona ..	Poona..	1,849	2,317	12	1253·1	6·49	1309·4	13·87
	Sattara.	258	204	3	790·7	11·62	1159·8	8·82
	Ahmednuggur ..	517	750	7	1450·7	13·54	1497·5	12·48
	Asseerghur . ..	105	132	4	1257·1	38·10	1308·9	15·81
	Belgaum	934	960	8	1027·9	8·57	1158·2	11·29
	Kirkee	517	568	7	1098·7	13·54	1516·6	12·37
	Sholapore	118	359	2	3042·4	16·95	1715·7	15·71
Mhow ..	Mhow	1,001	1,727	24	1725·3	23·98	1645·6	14·04
	Indore	78	138	1	1769·2	12·82	1599·3	13·70
	Neemuch	281	575	13	2046·3	46·26	2521·0	44·18
	Nusseerabad ..	569	1,281	29	2251·3	50·97	1630·7	32·40
	Ajmere	20	18	..	900·0	..	1997·1	17·86
Northern ..	Deesa..	649	661	14	1018·5	21·57	1288·3	12·86
	Ahmedabad. ..	249	487	5	1955·8	20·08	1822·6	17·67
	Mount Aboo ..	90	139	..	1544·5	..	1396·5	17·90
Scinde ..	Kurrachee	671	2,083	12	3104·3	17·89	1195·3	13·45
	Hydrabad	417	538	10	1290·2	23·98	1176·1	12·52
	Aden	584	595	14	1018·9	23·97	1036·9	22·65
	Deolalee Rest House ..	462	1,291	16	2794·3	34·63	..	..
	Sanitaria & Invalids ..	232	650	25	2801·7	107·76	..	..
	On the March, &c.	362	344	15	950·3	41·44	1097·9	25·84

The admissions have been lower than in 1868 in the Presidency Division, and at all the stations in the Poona Division except Sholapore. At all the stations in the other Divisions there has been an increase, but especially at Kurrachee and Nusseerabad ; at the former the ratio was twice and a half, and at the latter twice, as high as in the preceding year. Compared with the average of the nine years 1860–8, the mortality shows a very marked increase at Mhow, Nusseerabad, Deesa, Hyderabad, and Asseerghur, and the admissions at Kurrachee, Sholapore, and Nusseerabad.

The following Tables show the admissions and deaths by the different classes of diseases in each of the Military Divisions :—

Order.	Military Divisions ...	Presidency.		Poona.		Mhow.		Northern.		Scinde.		Aden.		Deolalee.		Troops on March		Presidency.		Poona.		Mhow.		Northern.		Scinde.		Aden.		Deolalee.		Troops on March.	
	Average Annual Strength	525		4,298		1,949		988		1,088		584		462		362		Annual Ratio per 1,000 of Mean Strength.													
	Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
	I. *General Diseases.*																														
1	Febrile Group...	123	1	1886	11	1766	37	517	10	1622	7	115	4	823	10	127	6	234·3	1·90	438·9	2·56	906·1	18·99	523·3	10·12	1492·2	6·44	196·9	6·85	1781·4	21·65	350·8	16·57
2	Constitutional ,, ...	64	...	742	4	429	1	110	...	148	1	73	1	70	1	57	2	121·9	...	172·7	·93	220·1	·51	111·3	...	136·2	·92	125·0	1·71	151·5	2·16	157·5	5·53
	II. *Local Diseases.*																														
	Diseases of the—																														
1	Nervous System ...	7	1	79	6	51	9	18	4	32	6	16	3	14	...	4	1	13·3	1·90	18·4	1·40	26·2	4·62	18·2	4·04	29·4	5·52	27·4	5·14	30·3	...	11·0	2·76
2	Eye	9	...	163	...	80	...	52	...	32	...	44	...	7	...	7	...	17·1	...	37·9	...	41·0	...	52·6	...	29·4	...	75·4	...	15·2	...	19·3	...
3	Ear	...	...	18	...	12	...	18	...	8	...	4	...	1	...	...	...	...	...	4·2	...	6·2	...	18·2	...	7·4	...	6·8	...	2·2	...	...	...
4	Nose	...	...	3	...	2	...	...	...	3	...	1	...	2	...	...	...	...	...	·7	...	1·0	...	...	...	2·8	...	1·7	...	4·3	...	...	...
5	Circulatory System .	2	...	62	1	20	6	14	2	42	2	7	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	Absorbent ,, ...	21	...	99	...	44	...	16	...	30	...	3	...	6	...	9	...	3·8	...	14·4	·23	10·3	3·08	14·2	2·03	38·6	1·84	12·0	...	2·2	...	2·8	...
8	Respiratory ,, ...	10	...	202	3	133	4	34	1	64	...	32	...	18	...	3	...	40·0	...	23·0	...	22·6	...	16·2	...	27·6	...	5·1	...	13·0	...	24·9	...
9	Digestive ,, ...	51	...	887	9	497	6	200	...	253	3	134	2	193	3	71	3	19·1	...	47·9	·70	68·2	2·05	34·5	1·01	58·9	...	54·8	...	39·0	...	8·3	...
10	Urinary ,, ...	24	...	289	1	229	1	74	...	49	...	16	...	23	1	18	...	97·1	...	206·4	2·10	255·0	3·08	202·4	...	232·7	2·76	229·5	3·42	417·7	6·50	196·1	8·29
11	Generative ,, ...	3	...	55	...	36	...	11	...	13	...	6	...	4	...	3	...	45·7	...	67·3	·23	117·5	·51	74·9	...	45·1	...	27·4	...	49·8	2·16	49·7	...
12	Organs of Locomotion	1	...	13	...	10	...	3	...	1	...	4	...	...	...	1	...	5·7	...	12·8	...	18·6	...	11·1	...	12·0	...	10·3	...	6·6	...	8·3	...
13	Cellular Tissue ...	15	...	100	...	19	...	15	...	12	...	19	...	6	...	3	...	1·9	...	3·0	...	5·1	...	3·9	...	·9	...	6·8	...	...	...	2·8	...
14	Cutaneous system ...	20	...	241	...	147	...	69	...	168	1	46	...	52	...	18	...	28·6	...	23·3	...	9·7	...	15·2	...	11·0	...	32·5	...	13·0	...	8·3	...
	III. *Conditions, &c.*																	38·1	...	56·1	...	75·4	...	69·8	...	154·6	·92	78·8	...	112·6	...	49·7	...
	Debility	...	...	39	...	25	...	25	...	14	...	4	...	4	...	6	...	...	...	9·1	...	12·8	...	25·3	...	12·9	...	6·8	...	8·6	...	16·6	...
	IV. *Poisons* ...	7	...	38	1	21	1	23	...	18	2	15	...	9	1	1	...	13·3	...	8·9	·23	10·8	·51	23·3	...	16·5	1·84	25·7	...	19·5	2·16	2·8	...
	V. *Injuries.*																														
2	Accidental	33	...	368	3	218	1	88	...	112	...	54	1	58	...	15	2	62·9	...	85·7	·70	111·9	·51	89·1	...	103·0	...	92·5	1·71	125·5	...	41·4	5·53
3	Homicidal	...	1	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·90	·9	...	...	...	...	...	...	...	...	...	...	...	...	...
4	Self-inflicted... ...	...	...	1	4	...	1	...	2	...	...	3	...	...	1	...	...	...	...	·2	·93	...	·51	...	2·03	...	...	...	5·14	...	...	...	2·76
6	Judicial	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1·90	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	VI. *Surgical Operations*	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3·4	...	...	...	...	...
	No appreciable Disease ...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	·2	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total	390	4	5290	43	3739	67	1287	19	2621	22	595	14	1291	16	344	15	742·8	7·60	1231·1	10·01	1918·4	34·37	1302·6	19·23	2411·2	20·24	1018·8	23·97	2794·4	34·63	950·3	41·44

Military Divisions ...	Presidency.		Poona.		Mhow.		Northern.		Scinde.		Aden.		Deolalee.		Troops on the March.		Presidency.		Poona.		Mhow.		Northern.		Scinde.		Aden.		Deolalee.		Troops on the March.	
Average Annual Strength... ...	525		4,298		1,949		988		1,088		534		462		362		Annual Ratio per 1,000 of Mean Strength.															
GENERAL DISEASES.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Febrile—																																
Eruptive Fevers ...	...	...	9	1	7	...	2	...	...	...	2	...	...	...	...	...	...	...	2·1	·23	3·6	...	2·0	...	...	...	3·4	...	...	...	...	...
Continued ,, ...	37	...	935	1	44	2	81	1	231	6	32	1	7	...	47	3	70·5	...	217·6	·23	22·6	1·02	82·0	1·01	212·5	5·52	54·8	1·71	15·1	...	129·8	8·29
Paroxysmal Fevers ...	84	1	927	3	1647	3	418	1	1390	...	81	3	799	1	78	2	160·0	1·90	215·7	·70	845·1	1·54	423·1	1·01	1278·8	...	138·7	5·14	1729·4	2·16	216·4	5·52
Malignant Cholera ...	...	...	7	6	56	32	11	8	...	...	...	...	10	8	1	1	...	...	1·6	1·40	28·7	16·43	11·1	8·10	...	...	...	...	21·7	17·32	2·8	2·76
Choleraic Diarrhœa...	...	...	1	...	2	...	...	...	...	...	...	...	1	1	...	...	...	...	·2	...	1·0	...	...	...	...	...	...	...	2·2	2·16	...	...
Influenza	2	...	2	...	7	...	5	...	...	...	...	...	5	...	...	...	3·8	...	·5	...	3·6	...	5·1	...	...	...	...	...	10·8	...	...	...
Erysipelas	...	...	4	...	2	...	...	...	...	...	...	...	1	...	...	...	...	...	·9	...	1·0	...	...	...	...	...	...	...	2·2	...	...	...
Other Diseases ...	...	...	1	...	1	...	...	...	1	1	...	...	...	...	1	...	...	...	·2	...	·5	...	...	...	·9	·92	...	...	...	...	2·8	...
Constitutional—																																
Rheumatism	29	...	158	1	110	...	33	...	50	...	25	...	28	...	8	...	55·2	...	36·8	·23	56·4	...	33·4	...	46·0	...	42·8	...	60·6	...	22·1	...
Syphilis	32	...	512	...	281	...	66	...	61	...	9	...	22	...	36	1	61·0	...	119·2	...	144·2	...	66·8	...	56·1	...	15·4	...	47·6	...	99·5	2·76
Scrofula, Phthisis, &c.	3	...	42	3	22	1	5	...	16	1	14	1	9	1	8	...	5·7	...	9·8	·70	11·3	·51	5·1	...	14·7	·92	24·0	1·71	19·5	2·16	22·1	...
Scurvy and Purpura	...	...	5	...	2	...	...	...	...	...	...	...	...	...	1	...	...	...	1·1	...	1·0	...	...	...	...	...	...	...	...	...	2·8	...
Anæmia	...	...	23	...	9	...	3	...	21	...	25	...	11	...	4	1	...	...	5·3	...	4·6	...	3·0	...	19·3	...	42·8	...	23·3	...	11·0	2·76
Other Diseases ...	...	...	2	...	5	...	3	...	...	...	...	...	...	...	...	...	...	...	·5	...	2·6	...	3·0	...	...	...	...	...	...	...	...	...

Bombay. *Eruptive fevers* were not unusually prevalent in any of the Divisions There were 16 cases of small-pox, with 1 death. Six of these occurred at Poona, 5 among the effectives, and 1 at the Depôt, and 5 occurred at Ajmere. The others were at Sattara, Neemuch, Nusseerabad, and Mount Aboo.

Continued fevers were very prevalent in the Poona and Scinde Divisions; in the former at Poona and Ahmednuggur, and in the latter at Kurrachee. At Poona, the 1st Battalion 2nd Regiment, which had been serving during the two preceding years at Aden and Hyderabad, had 285 cases, but no deaths; the 1st Battalion 8th Regiment, which arrived in India from Malta at the end of the preceding year, had 269 cases, with 1 death; and the 59th, which landed in Bombay from Ceylon in March had, during the nine months, 154 cases, all but 4 of which were returned as *febricula*. At Ahmednuggur the 3rd Hussars, which had arrived in India from England in December 1868, had 221 cases, none of which were fatal, in a strength of 426 men. The Battery of Artillery at the same station, which was just completing its term of service in India, had only 6 cases. At Kurrachee continued fevers were confined to the 1st Battalion 21st Regiment, which arrived in Bombay from England on the 21st March, and was quartered at Kurrachee, with a detachment of 112 men at Hyderabad. During the nine months and a quarter it was in India there were 221 admissions and 7 deaths by continued fevers, and of these 163 cases and 4 deaths occurred in April and May. Their prevalence was attributed by the Medical Officer in charge to the regiment "landing in India "at a bad season of the year." There must, however, have been other causes also in operation, for the detachment at Hyderabad, of an average strength of 112 men, had only 7 cases in the nine months, while the Head-Quarters at Kurrachee, in an average strength of 691, during the same period had 213 cases. The Battery of Royal Artillery at Kurrachee, during that period, did not admit a single case of continued fever.

Paroxysmal fevers were much less prevalent than in 1868 in the Presidency and Poona Divisions, but in that year they had been greatly in excess of the average there. In all the other Divisions the ratios show a considerable increase, but especially in the Scinde and Mhow Divisions. In the Scinde Division the great excess was due to the prevalence of ague in the 1st Battalion 21st Regiment at Kurrachee, where 1,118 admissions occurred in an average strength of 671 men. At Hyderabad there were 272 admissions in a strength of 417. The Artillery at these stations did not suffer to anything like the same extent as the 21st Regiment, the battery at the former having had 109 cases among 166 men, and at the latter 70 in a strength of 142 men. But although so great a source of inefficiency, these fevers did not cause a single death in this Corps. Their excessive prevalence occurred in the last quarter of the year, 893 of the cases at Kurrachee, and 194 of those at Hyderabad having been admitted in it. In the Mhow Division paroxysmal fevers were very prevalent at all the stations; at Mhow there were 834 cases in a strength of 1,001, at Neemuch 252 in 281, at Nusseerabad 513 in 569, and at Indore 48 cases in a strength of 78. As in the Scinde Division, their great prevalence was in the last quarter of the year, 1,077 admissions having occurred in it out of a total of 1,647 for the whole year. The only other stations in the Command where these fevers were extremely prevalent was Sholapore, in the Poona Division, where 253 cases were admitted from an average strength of 118 men of the E Battery 18th Brigade Royal Artillery, and Deolalee, where they amounted to 799 in an average strength of 462 men.

Malignant Cholera.—No cases of this disease occurred in the Presidency, Scinde, and Aden Divisions, nor did it prevail as an epidemic in the Poona Division. One case occurred at Poona, two at Asseerghur, and four at Kirkee, all of which proved fatal except one at the last station. In the Mhow Division 56 cases and 32 deaths, in the Northern 11 with 8 deaths, and at Deolalee 12 with 8 deaths occurred. At Mhow the disease broke out in the 2nd Dragoon Guards in March, and continued to show itself in the garrison till towards the end of August. In that period there were 14 cases and 10 deaths; the 2nd Dragoon Guards had 6 cases and 4 deaths, the 95th 6 cases and 5 deaths, and the D Battery E Brigade Royal Horse Artillery 2 cases and 1 death. At Neemuch it prevailed from March to September, causing 14 admissions and 7 deaths, of which 3 cases and 1 death were in the F Battery

18th Brigade Royal Artillery, and the others in a Detachment of the 2nd Battalion 1st Foot of an average strength of 164 men. At Nusseerabad there were 26 cases and 14 deaths. It did not break out among the troops there till June, when 22 cases with 13 deaths occurred in the Head-Quarters 2nd Battalion 1st Foot, the strength of which, at the time of the outbreak, was 505 men. During the next three months there were three cases with one death, all in the 1st Foot except one, which did not prove fatal, in the Royal Artillery. In the Northern Division 5 cases, all of them fatal, occurred in the 49th Regiment at Deesa in August, and 6, with 3 deaths, in the Royal Artillery at Ahmedabad in May, June, and July. At Deolalee there were 10 cases and 8 deaths of cholera, and a fatal case of choleraic diarrhœa. They occurred in January, February, July, and August, and the case of diarrhœa in April. *Bombay.*

Rheumatism has not differed greatly in amount from the preceding year except at Aden, where there has been a considerable increase, but where, in 1868, it had been exceptionally low. There has also been a slight increase in the Mhow Division.

Syphilis was extremely prevalent in the Poona and Mhow Divisions, and very much below the average at Aden. In the Poona Division the stations of Kirkee, Belgaum, Ahmednuggur, and Poona had a very high ratio of admissions, while at Sattara, Asseerghur, and Sholapore the numbers were very low. In the Mhow Division, Nusseerabad and Neemuch furnished excessively high ratios; but at Mhow the admissions amounted only to 80 per 1,000, or 20 per 1,000 under the average of the Command. The 2nd Battalion 1st Foot had much the largest proportion of cases, the admissions in it having amounted to 217 per 1,000 of mean strength; one-fifth of all the admissions by primary syphilis in the Command took place in that corps.

The following Table shows the admissions into hospital by syphilis—primary and secondary—per 1,000 of mean strength at each of the stations in the Command in 1868 and 1869:—

	1868.	1869.		1868.	1869.
Colaba	32·3	160·0	Neemuch	106·5	135·2
Poona	96·2	99·5	Nusseerabad ..	97·6	265·4
Sattara	60·0	15·4	Ajmere	140·0	200·0
Ahmednuggur ..	97·2	100·5	Deesa	95·4	67·8
Asseerghur	52·2	47·6	Mount Aboo ..	31·9	122·0
Belgaum	290·8	169·1	Kurrachee	81·3	71·5
Kirkee	131·4	207·0	Hydrabad	35·8	31·2
Sholapore	8·6	16·9	Aden	36·0	15·4
Mhow	99·6	80·0	Deolalee	...	47·6
Indore	102·6	102·6			

Omitting all reference to the small stations where the average strength was under 100 men, there has been a marked increase in the admissions by syphilis at Colaba, Kirkee, Nusseerabad, and Neemuch, and decrease at Belgaum, Deesa, Mhow, Kirkee, and Aden. At the other stations the difference has not been greater than might have been expected in results, when the numbers under observation are limited.

Scrofula and Phthisis.—The admissions were much above the average at Aden and in the Scinde Division—at the former in the 82nd, and at the latter in the 1st Battalion 21st Regiment, but the increase may probably have been an accidental variation, resulting from the small numbers under observation. The mortality was low in all the Divisions.

Anæmia caused a high proportion of admissions in the Scinde Division, chiefly in the 21st Regiment at Kurrachee, the sequel of malarious fever, and at Aden in the 82nd Regiment, "among either the young soldiers who were "constitutionally weak, or those who had suffered from disease in India."

LOCAL DISEASES.—The ratio of mortality by *diseases of the nervous system* was high in the Mhow, Northern, Scinde, and Aden Divisions, chiefly from cases

Bombay. of sunstroke and apoplexy. In the Poona Division 7 cases and 3 deaths of sunstroke occurred in the 3rd Hussars at Ahmednuggur, 7 cases, all of which recovered, in the 108th Regiment at Belgaum, and 1 fatal case at Poona. In the Mhow Division the 2nd Battalion 1st Regiment had 16 cases and 3 deaths at Nusseerabad, and 2 cases at Neemuch, and the Royal Artillery 1 case at Nusseerabad, and 1 fatal case at Neemuch: there was also 1 fatal case in the Royal Horse Artillery at Mhow. In the Northern Division there was only 1 fatal case of sunstroke at Ahmedabad, but there were 3 deaths from apoplexy at Deesa. In the Scinde Division the 21st Regiment had 4 cases at Kurrachee, and 4, with 1 death, at Hydrabad; the detachment of the 82nd had 3 cases and a death at Hydrabad; the C Battery E Brigade Royal Horse Artillery, at the same station, 7 cases and 2 deaths; and the B Battery 18th Brigade Royal Artillery 1 fatal case at Kurrachee. At Aden 4 cases and 2 deaths occurred, all in the two Batteries of Royal Artillery.

Diseases of the Eyes.—Ophthalmia did not prevail as an epidemic in any of the corps. The admissions were above the average, however, in the 1st Battalions 2nd and 8th Regiments at Poona, the 49th Regiment at Deesa, the 82nd at Aden, the Head-Quarters 2nd Battalion 1st Regiment at Nusseerabad, and the B Battery 18th Brigade Royal Artillery, at Kurrachee.

Diseases of the circulatory system were not unusually prevalent in any of the Divisions except Scinde, where the ratio of admissions was considerably more than double the average, owing to the occurrence of 36 cases returned under the head of palpitation of the heart, in the 21st Regiment at Kurrachee. It is worthy of remark that there were no cases under this head in the detachment of the Regiment at Hydrabad.

Diseases of the digestive system furnished the highest proportion of admissions and deaths of all the orders of local diseases; dysentery, diarrhœa, and hepatitis were the most prevalent and fatal. The admissions by these three diseases per 1,000 of the strength in each of the Military Divisions in 1868 and 1869 were as follows:—

Military Divisions.	1868.	1869.	Military Divisions.	1868.	1869.
Presidency	102·7	40·0	Scinde	97·7	139·7
Poona	140·0	122·8	Aden	111·3	116·4
Mhow	102·7	153·9	Deolalee	..	320·3
Northern	81·6	114·4			

This Table shows a decrease in the admissions by these diseases in the Presidency and Scinde Divisions, and an increase in all the others, to a very slight extent at Aden, but very marked in the others. At Deolalee the ratio of admissions was more than double that of any of the Military Divisions, but the cases were chiefly of diarrhœa among the troops recently arrived in India. In the Mhow Division the excess in all these diseases was most marked at Nusseerabad, in the 1st Regiment, and diarrhœa was also unusually prevalent in the 95th at Mhow from April to July, during which period cholera was rife in the district. In Scinde, at Kurrachee, the 21st had a large number of admissions by dysentery and diarrhœa. In the Poona Division the 108th Regiment, at Belgaum, furnished a high ratio of cases of dysentery and hepatitis, the result of previous service in the Deccan, and the admissions from diarrhœa were considerably above the average at Poona in the 2nd and 8th Regiments. In the Northern Division the increase, compared with the preceding year, was chiefly in diarrhœa in the 49th Regiment, at Deesa, in August, September, and October, co-incident with the prevalence of cholera.

Dyspepsia and tonsillitis were the only other diseases of this order which prevailed to any extent; the only other deaths were 1 by enteritis, 2 by peritonitis, and 3 by ascites.

Diseases of the urinary organs were very prevalent in the Mhow Division, and were also considerably above the average in the Northern and Poona Divisions. The admissions in this order consisted chiefly of cases of gonorrhœa and its consequences—stricture, epididymitis, and bubo. The excess in the Mhow Division was principally in the 1st Regiment, at Nusseerabad and

Neemuch, and though not to so marked an extent, in the Royal Artillery at these two stations. In the Poona Division, Ahmednuggur and Belgaum were the stations at which these diseases were most prevalent. *Bombay.*

INJURIES.—The accidental deaths were 7 in number; 2 in the Artillery by drowning, 1 in the 1st Regiment and 1 in the 108th Regiment by concussion of the brain, 1 in the 8th Regiment by multiple injury, the result of a fall from a great height, 1 in the 23rd Regiment by fracture of skull by a fall, and 1 in the 82nd Regiment by laceration of the brain without fracture of the skull, from a fall of about 30 feet from the upper verandah of the barrack at Aden.

Of the suicidal deaths, 1 was in the Cavalry, 2 were in the Artillery, and 8 were in the Infantry. The homicidal and judicial deaths were in the 23rd Regiment, being those of a Lance-Serjeant who was shot in barracks at Colaba, and a private executed for the murder.

The sickness and mortality in each of the corps serving in the Command were as follows:—

Regiments.	Average Annual Strength.	Admitted into Hospital.	Deaths.			Annual Ratio per 1,000.		Stations during the Year.	
			In India.	Of Invalids.	Total.	Admitted.	Died.		months.
CAVALRY.									
2nd Dragoon Guards ..	329	499	8	..	8	1516·7	24·31	Mhow	11½
								On march	½
3rd Hussars ..	426	633	6	..	6	1485·9	14·08	On march	½
								Ahmednuggur	11⅔
15th „ ..	16	11	..	..	..	687·5	..	Arrived from England.	
								Deolalee	⅓
Total Cavalry.	771	1,143	14	..	14	1482·5	18·15		
ROYAL ARTILLERY.									
								A, Kirkee	12
								B, Kirkee	12
E Brigade R.H.A.	575	856	11	2	13	1488·7	22·60	C, Hydrabad	12
								D, Mhow	12
								Hd.-Qrs. and No. 1, Deolalee	9
								On march	1
								Mhow	½
								No. 2, Aden	11
								No. 3, Aden	11
								No. 4, Khandalla	4
								„ Kirkee	5½
6th Brigade R. A.	407	685	16	..	16	1683·0	39·31	„ Colaba	1
								No. 5, Deolalee	9
								„ On march	½
								„ Belgaum	1½
								No. 6, Poona	2⅔
								„ Kirkee	7
								„ Colaba	1
								Brigade arrived from England in November and December.	
9th „ „	70	109	2	..	2	1557·1	28·57	B, Kirkee	½
								D, On march	2
								E, Deolalee	2
								F	

Bombay.

Regiments.	Average Annual Strength.	Admitted into Hospital.	Deaths. In India.	Deaths. Of Invalids.	Deaths. Total.	Annual Ratio per 1,000. Admitted.	Annual Ratio per 1,000. Died.	Stations during the Year.
RL. ARTILLERY—*continued.*								
14th Brigade R.A.	494	755	8	..	8	1528·4	16·19	D, Ahmedabad 10½ months. E, On march ⅔ „ Deolalee 9⅔ F, Nusseerabad 9½ „ On march 1 G, Ahmednuggur 10 „ On march ½ Brigade embarked for England.
18th „ „	864	1,552	14	2	16	1796·3	18·51	A, Ahmedabad 12 B, Kurrachee 12 C, Belgaum 12 D, Kirkee 12 E, Sholapore 12 F, Neemuch 12
21st „ „	9	1	..	..	..	111·1	..	Nos. 1 and 4 Batteries, Aden ⅔ Embarked for England.
Total Artillery..	2,419	3,958	51	4	55	1636·2	22·73	
INFANTRY.								
2nd Bn. 1st Foot.	852	1,706	51	..	51	2002·3	59·85	Nuseerabad 12 Detachment at Neemuch.
1st „ 2nd „	852	952	8	1	9	1117·4	10·56	Poona 9⅕ Bombay 2⅖ Detachment at Hydrabad and Sattara.
1st „ 8th „	803	1,090	10	1	11	1357·4	13·69	Poona 10½ With Detachment at Sattara. On march 1½
1st „ 21st „	637	2,250	15	1	16	3541·6	25·11	Arrived from England. Kurrachee 9 Detachments at Ghizree and Hydrabad.
1st „ 23rd „	487	371	7	..	7	761·8	14·37	Colaba and Asseerghur 9⅓ Embarked for England.
49th Regiment ..	809	899	21	1	22	1111·3	27·19	Deesa 12 Detachment at Mount Aboo.
59th „ ..	658	654	3	..	3	993·9	4·55	Arrived from Ceylon Poona 9

Regiments.	Average Annual Strength.	Admitted into Hospital.	Deaths.			Annual Ratio per 1,000.		Stations during the Year.	
			In India.	Of Invalids.	Total.	Admitted.	Died.		months.
INFANTRY—*cont.*									
82nd Regiment ..	625	658	14	1	15	1052·8	24·00	Aden Detachment at Hydrabad.	12
95th „ ..	731	1,378	16	..	16	1885·1	21·88	Mhow Detachments at Indore, Deolalee and Poona.	12
96th „ ..	35	13	..	..	..	371·4	..	Poona Embarked for Calcutta.	½
108th „ ..	856	1,017	15	1	16	1188·1	18·69	Belgaum Detachment at Deolalee.	12
Total Infantry..	7,345	10,994	160	6	166	1496·8	22·60		

The admissions and deaths were highest in the Royal Artillery, and lowest in the Cavalry. There was a very slight difference between the ratio of admissions in the Cavalry and Infantry, and of deaths in the Artillery and Infantry.

In the Cavalry the 2nd Dragoon Guards at Mhow had the highest proportion both of admissions and deaths. In the Artillery the 18th Brigade had the highest ratio of admissions, and the 6th of deaths; in the Infantry the admissions were highest in the 1st Battalion 21st at Kurrachee, and the 2nd Battalion 1st Foot at Nusseerabad, with a detachment at Neemuch, had the greatest amount of mortality.

SANITARY REPORT.

Deputy Inspector-General Foss makes the following remarks in his Sanitary Report:—

Barracks.—The construction of new barracks, and in fact nearly all the public works, were arrested towards the close of the year, in consequence of the financial deficit.

At Deolalee, which is now the principal depôt for invalids and other troops from the Bengal Presidency, suitable buildings for the sick and their attendants, have not yet been constructed. It is highly desirable that this work should be completed, and the whole station properly levelled and drained with as little delay as possible, if Deolalee is to become a permanent depôt.

In accordance with the recommendation of the Committee ordered by Government to report on the Kurrachee Depôt Barracks, which assembled in July 1869, these buildings are to undergo certain alterations, and are in future to be used only as temporary rest houses for troops during the cold season, their occupation in this way, however, being restricted at any one time, to a period of from 15 to 20 days.

Owing to the orders which prevent the despatch of insane soldiers to England in H. M. Indian Troopships, a considerable number of this class of invalids is liable to be collected in Bombay previous to the departure of the

Bombay. invalids *viâ* the Cape, and unless arrangements can be made for sending them to England, *viâ* the Suez Canal, from time to time, it is most important that better and more secure accommodation than that afforded by the present Lunatic Asylum at Colaba, should be provided.

Flooring.—The flooring of the barrack-rooms at Deolalee, and numerous other stations, still continues defective, being composed solely of mud, with or without a coating of cowdung. It is almost unecessary to say that all such flooring is objectionable in the highest degree.

Upper Stories.—Many of the new barracks in process of construction are to be upper storied, but it is to be feared that the costliness of some of these buildings, and the faulty designs of others, may lead to the abandonment of this improvement. As an instance of the superiority of upper storied over single storied barracks, Deputy Inspector-General Stewart has reported that there was much less fever in the 59th Regiment at Poona, occupying upper storied barracks, than in the 1st Battalion 2nd, and the 1st Battalion 8th Regiments, at the same station in single storied, and this statement is borne out by the Statistical Returns of these regiments. At the same time, it is right to state that the upper stories at Nusseerabad were found to be intensely hot, but this defect can scarcely be considered irremediable, or as resulting from any other cause than faulty construction or design.

Lighting.—The insufficiency of the oil lamps in use for the lighting of the barracks and hospitals at night has been very generally commented on by the Medical Officers, many of whom suggest the adoption of Kerosine oil lamps instead. No plan, however, that is both practicable and ecomical, has yet been devised for stations where gas is not available.

Ventilation.—The ventilation of the barracks and hospitals is considered generally satisfactory, and the exceptional instances will doubtless be remedied as soon as funds for the work are forthcoming.

Latrines.—The dry earth conservancy has been carried out as before. At Asseerghur the sewage has hitherto been thrown over the steep side of the fort, thereby creating a very serious nuisance. This is to be rectified by the construction of a gangway, projecting about 20 feet beyond the face of the fort wall, on which will run a small "trolly" or waggon carrying the filth pans, the contents of which will be dropped through a trap-door, at the extreme end of the gangway, to the plain below where it will be disposed of in the usual manner.

Ablutionary Arrangements.—These are generally satisfactory, and at most stations there are means provided for private ablution.

Sanitary Condition of the Vicinity of Barracks and Stations.—It is probably safe to assert that no dwellings in the world are kept in a cleaner state than the barracks in this country, and that the sanitary condition of their immediate vicinity is, as a rule, quite unobjectionable. With the stations, however, and the towns and villages in their vicinity, the case is altogether different. For these it is notorious that there is no efficient sanitation, and that in many instances there is scarcely an attempt at sanitation at all. There is no artificial drainage of any kind, and the result is that whenever the rainfall is unusually heavy, and there are any other unfavourable meteorological conditions malarial diseases become epidemic, and affect injuriously, not only the native population, but also the European. The rainfall of 1869 was heavier than in ordinary years at nearly every station in the Command, but especially in Sind, and the Statistical Returns show that malarial diseases were unusually prevalent throughout the Presidency. Such being the case, all experience justifies our regarding the two events as cause and effect.

It was mentioned in the Report for 1868 that malarial fever had been very prevalent at Sholapore, where it was attributed to the existence of an undrained marsh in the neighbourhood of the barracks. No steps were taken for the drainage of this marsh, and as the men belonging to the battery of Artillery at that station continued to suffer most severely from malarial disease, Inspector-General Dr. Gordon, C.B., recommended the removal of the battery early in the present year, 1870, which was at once carried into effect. The question as to the drainage of the marsh was referred to the Sanitary Commission, but although no information has been received, whether the drainage has been effected or not, the station is no longer occupied by European troops.

Dieting of the Troops.—This has been generally satisfactory. At Nusseerabad, Neemuch, and Deesa, there was a deficiency of fresh vegetables from June to September, which was met by the use of preserved vegetables and lime juice. Some Medical Officers appear to consider the meat ration insufficient in the hot and rainy seasons, when the animals from want of pasturage are generally lean and ill-fed, but there has been no report of injury to the health of the troops from any defect of the rations. *Bombay.*

Supply of Ice.—At stations on the line of railway, ice is procurable for the sick in sufficient quantity, and the propriety of supplying ice machines at the hot interior stations is under consideration.

Intemperance.—It is satisfactory to record a diminution in the amount of intemperance among the troops, as evidenced both by a decrease of admissions to hospital, and of trials by Court-Martial from the result of this vice.

Water Supply.—A few patent filters, obtained from England, are now under trial, and the reports regarding them will appear next year. It is not likely, however, considering the recommendation of the Army Sanitary Committee on this subject, that patent filters will be adopted by Government for general use in barracks and hospitals. Nevertheless, the filtration by means of loose sand and charcoal in earthenware ghurras has not hitherto been found of any practical value.

Venereal Disease.—Under Section I. of Bombay Act III. of 1867 (The Bombay Cantonment Act), lock hospitals have been established at Aden, Ahmednuggur, Bombay, Belgaum, Deesa, Kurrachee, Mhow, Nusseerabad, Poona, Asseerghur, Deolalee, Hyderabad, Neemuch, Sattara, and Sholapore.

Special arrangements have been provided at several stations for the private ablutions of men at night.

The percentage to strength of the admissions for venereal disease in 1869 was 15·73. In 1868 it was 19·79, and in 1862, 30·27. Venereal disease, in fact, has been gradually decreasing for several years past, and this diminution was progressive in 1869, except at Nusseerabad, Neemuch, Kirkee, and Bombay, at which there was an increase, but this is stated to have been owing to the presence of large number of Cooly women employed on the public works, who added prostitution to their other avocations, but not in such a way as to render themselves amenable to the Contagious Diseases Act above mentioned.

Section II.

On the Extent of Invaliding.

During the year there were 2,634 invalids sent home from India, being in the ratio of 47·15 per 1,000 of mean strength. Bengal furnished 1,798, Madras 573, and Bombay 263, of these invalids. *India.*

There were 1,052 invalids from India finally discharged the Service at Netley during the year, being in the ratio of 18·79 per 1,000 of mean strength, or 2 per 1,000 under the proportion in the preceding year.

The following Table, framed from Abstract No. 23 in the Appendix, shows the influence of the different classes of diseases in causing invaliding:—

India.

Station	Invalids sent home from Bengal.	Madras.	Bombay.	Invalids from India discharged the service at Netley.
Mean Strength	35,173	10,277	10,538	55,988
Continued Fevers	21	1	1	..
Paroxysmal „	132	10	5	12
Rheumatism	119	25	15	28
Syphilis	87	54	19	59
Scrofula and Phthisis	174	50	36	157
Anæmia	128	9	14	27
Other Constitutional Diseases	7	2	1	5
Diseases of the—				
Nervous system	118	40	32	54
Eye „	16	6	11	51
Ear „	8	3	2	18
Nose „	3	..	..	..
Circulatory system „	158	35	27	252
Absorbent „	2	..	..	..
Respiratory „	73	14	9	19
Digestive „	402	201	50	113
Urinary „	30	8	4	15
Generative „	9	2	..	4
Organs of Locomotion	20	4	8	44
Cellular Tissue	1	2	1	2
Cutaneous system	22	14	4	15
Debility	234	84	18	141
Poisons	1	..	..	..
Accidental Injuries	30	9	6	28
Homicidal „	1	..	..	..
Self-inflicted „	..	..	..	1
Surgical Operations	2	..	..	7
Total	1,798	573	263	1,052
Ratio per 1,000 of mean Strength 1869	51·12	55·75	24·96	18·79
Ratio per 1,000 of mean Strength 1860-8	37·84	48·65	34·27	18·58

The extent of invaliding from Bengal was greater than in 1868, and considerably above the average of the last nine years; from Madras, though lower than in the preceding year, it was very high, and somewhat above the average; and from Bombay it was under the average, and also under the proportion in the preceding year. In Madras the excess was mainly due to the large numbers invalided by the 2nd Battalion 21st, and the 76th Regiment in Birmah, the 2nd Battalion 24th at Secunderabad, and the 3rd Battalion 60th Regiment at Bellary; the proportion was high, also, from the 45th Regiment at Fort St. George. We are unable at present to give similar information respecting the excess in Bengal.

Diseases of the digestive system, chiefly hepatitis, dysentery, and diarrhœa, were the most frequent causes of invaliding in all these Presidencies. Debility, the result of malarious disease, was next in frequency in Bengal and Madras. Scrofula and phthisis and diseases of the circulatory system were also important causes of invaliding, and were assigned as the disabilities in upwards of two-thirds of the men discharged the Service at Netley, diseases of the digestive system, debility, and syphilis being next in point of frequency as causes of discharge.

Section III.

Mean Daily Sick.

India.

The average number constantly sick of the troops in Bengal was 2,069, in Madras 638, and in Bombay 578, being respectively in the ratio of 58·82, 62·08, and 54·85 per 1,000 of mean strength. The proportion in Bengal was considerably above, in Madras slightly under, and in Bombay considerably under, the preceding year.

The following Table gives the usual information calculated on these numbers:—

	Bengal.		Madras.		Bombay.	
	1869.	1860-68.	1869.	1860-68.	1869.	1860-68.
Ratio per 1,000 constantly Sick ..	58·82	63·45	62·08	63·13	54·85	62·14
	Days.	Days.	Days.	Days.	Days.	Days.
Average Sick Time to each Soldier	21·47	23·16	22·66	23·04	20·02	22·68
Average Duration of Cases ..	12·72	13·85	17·05	16·51	13·11	14·91

The results for Madras differ but slightly from the average of the preceding nine years. In Bengal and Bombay, but especially the latter, the proportion constantly sick has been considerably under the average, and in both there has been a reduction in the average sick time to each soldier, and in the average duration of the cases.

Section IV.

Influence of Age on the Mortality.

The strength and deaths, in quinquennial periods of life are shown for each regiment serving in the Madras and Bombay Commands for the year under review in Abstract No. 24 in the Appendix, from which the following Table has been framed:—

India.

	Under 20 years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		
	Strength on 1st January.	Died during Year.	Strength on 1st January.	Died during Year.	Strength on 1st January.	Died during Year.	Strength on 1st January.	Died during Year.	Strength on 1st January.	Died during Year.	Strength on 1st January.	Died during Year.	
Madras	691	4	1,960	37	2,971	80	2,278	74	677	35	118	5	
Bombay	573	7	2,401	54	2,495	45	1,664	57	700	28	86	8	
Total	1,264	11	4,361	91	5,466	125	3,942	131	1,377	63	204	13	
Ratio of Deaths per 1,000 of Strength ..	8·70		20·87		22·87		33·23		45·75		63·73		
Ratio of Deaths per 1,000 of Strength in— Madras and Bombay, 1861-8 ..	5·62		14·47		21·60		30·21		39·75		53·79		

The ratio of mortality at the ages 20 and under 25 was considerably above the average; the excess was chiefly in the 2nd Battalion 1st Regiment in Bombay, and the 2nd Battalion 24th Regiment in Madras. There was also a great increase at the age of 40 and upwards, but the numbers under observation were very small, and therefore liable to considerable fluctuation. At all the ages there was an increase, but with these exceptions the difference was not very striking.

XV.—ON THE HEALTH OF TROOPS ON BOARD SHIP.

STATISTICAL REPORT.

The Ship Returns for the year show the following numbers of troops to have embarked. *Troops on Board Ship.*

I.	Troops or drafts proceeding on foreign service	9,948
II.	Do. returning from foreign service	5,699
III.	Do. passing by sea from one colony to another, or from one station in a military Command to another	5,756
IV.	Invalids and "time-expired men" returning to England	5,278

The last group comprises 3,086 invalids, 1,342 time-expired men, and 850 effectives embarked with the invalids; it has been found impossible to separate these classes correctly from each other.

I. Troops proceeding on Foreign Service.

The Ship Returns account for 9,948 men embarked for foreign service, representing an average *annual* strength of 1,369, among whom 703 casses of sickness and 10 deaths occurred during the voyage, being respectively in the ratio of 513 and 7·30 per 1,000 of mean *annual* strength.

The diseases by which the admissions and deaths were caused are stated in detail in Abstract No. 25 in the Appendix, from which the following Table has been framed:—

Troops on Board Ship.

Order.	Diseases.	To India, *viâ* Egypt. Admitted.	Died.	Ratio per 1,000 Admitted.	Ratio per 1,000 Died.	To India, *viâ* the Cape. Admitted.	Died.	Ratio per 1,000 Admitted.	Ratio per 1,000 Died.	To Various Stations. Admitted.	Died.	Ratio per 1,000. Admitted.	Ratio per 1,000. Died.
	Strength	7,481				570				1,897			
	Number of men Embarked	718				176				475			
	Average *Annual* Strength												
	I. *General Diseases.*												
1	Febrile Group ..	39	1	54·3	1·39	3	..	17·0	..	11	..	23·2	..
2	Constitutional „ ..	125	..	174·1	..	20	..	113·6	..	24	..	50·5	..
	II. *Local Diseases.* Diseases of the—												
1	Nervous System ..	8	1	11·1	1·39	..	..	..	..	6	1	12·6	2·11
2	Eye	9	..	12·5	..	1	..	5·7	..	7	..	14·7	..
5	Circulatory System ..	..	..	..	..	..	..	..	..	1	..	2·1	..
6	Absorbent „ ..	2	..	2·8	..	..	..	..	..	..	..	..	..
8	Respiratory „ ..	22	1	30·6	1·39	4	..	22·7	..	17	2	35·8	4·21
9	Digestive „ ..	39	1	54·3	1·39	7	..	39·8	..	45	..	94·7	..
10	Urinary „ ..	69	..	96·1	..	9	..	51·1	..	20	..	42·1	..
11	Generative „ ..	11	..	15·3	..	1	..	5·7	..	3	..	6·3	..
12	Organs of Locomotion..	4	..	5·6	..	1	..	5·7	..	2	..	4·2	..
13	Cellular Tissue ..	13	..	18·1	..	10	..	56·8	..	4	..	8·4	..
14	Cutaneous System ..	58	..	80·8	..	11	..	62·5	..	29	..	61·1	..
	III. *Conditions, &c.* Debility..	3	..	4·2	..	..	..	..	..	3	..	6·3	..
	IV. *Poisons* ..	1	..	1·4	..	..	..	..	..	..	..	..	..
	V. *Injuries.*												
2	Accidental	21	1	29·3	1·39	12	..	68·2	..	27	1	56·9	2·11
4	Self-inflicted	..	1	..	1·39	..	..	..	..	..	..	..	..
5	Judicial..	..	..	..	..	..	..	..	..	1	..	2·1	..
	Total	424	6	590·5	8·34	79	..	448·8	..	200	4	421·0	8·43

The admissions were not greatly in excess in any of the groups; they were highest among the troops proceeding to India *viâ* Egypt, but the excess was chiefly in syphilis, gonorrhœa, and orchitis. Measles broke out among the children in three of the vessels in the first group, and six cases occurred among the men. Of the deaths, one was caused by a man leaping out of the train between Alexandria and Suez, one by concussion of the brain, caused by a fall into the hold of the ship, and one by sunstroke near Aden; the other three were by typhus fever, pneumonia, and enteritis respectively. In the second group, or troops proceeding to India by the Cape of Good Hope, there was no remarkable prevalence of disease, and no death occurred. In the third group the ratio of admissions by diseases of the digestive system was high, from the occurrence of diarrhœa among the troops on board the "Ellenborough" on the voyage from Gravesend to Singapore. Of the deaths in this group one was by drowning, one by apoplexy, and two by pneumonia; all except one of those by pneumonia occurred on board the hired transport "Clara," on the voyage to Ceylon.

II. Troops Returning from Foreign Service.

Troops on Board Ship.

The number of effectives embarked at foreign stations for England, as shown by the Ship Returns, amounted to 5,699, representing an average *annual* strength of 509. The cases of sickness occurring among them on the passage were 287, and the deaths 3, being respectively in the ratio of 564 and 5·89 per 1,000 of mean annual strength.

The following Table, framed from Abstract No. 26 in the Appendix, shows the admissions and deaths by the different classes of diseases :—

Order.	Stations / Diseases.	From Canada.				From West Indies, Australia, and Cape.				From India, *vid* Egypt.			
				Ratio per 1,000.				Ratio per 1,000.				Ratio per 1,000.	
		Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
	No. of men embarked ..	1,545				2,296				1,858			
	Average *Annual* Strength ..	62				289				158			
	I. *General Diseases.*												
1	Febrile Group ..	1	..	16·1	..	11	..	38·1	..	26	..	164·6	..
2	Constitutional „ ..	8	..	129·1	..	39	..	134·9	..	12	..	75·9	..
	II. *Local Diseases.* Diseases of the—												
1	Nervous System ..	..	..	..	..	..	..	..	..	1	..	6·3	..
2	Eye	..	..	..	..	6	..	20·8	..	4	..	25·3	..
5	Circulatory System ..	..	..	..	..	1	1	3·46	3·46	1	..	6·3	..
6	Absorbent „ ..	1	..	16·1	..	5	..	17·3	..	7	..	44·3	..
8	Respiratory „ ..	1	..	16·1	..	6	..	20·8	..	4	..	25·3	..
9	Digestive „ ..	3	..	48·4	..	13	..	45·0	..	19	1	120·3	6·32
10	Urinary .. „ ..	8	..	129·1	..	13	..	45·0	..	3	..	19·0	..
11	Generative „ ..	2	..	32·2	..	4	..	13·8	..	..	..	..	..
12	Organs of Locomotion ..	..	..	..	..	1	..	3·4	..	1	..	6·3	..
13	Cellular Tissue	1	..	16·1	..	3	..	10·4	..	3	..	19·0	..
14	Cutaneous System ..	3	..	48·4	..	32	..	110·7	..	13	..	82·3	..
	IV. *Poisons* ..	..	..	..	..	..	..	..	..	..	1	..	6·32
	V. *Injuries.*												
2	Accidental	..	..	..	..	28	..	96·9	..	3	..	19·	..
	Total	28	..	451·6	..	162	1	560·5	3·46	97	2	613·9	12·65

The ratio of admissions by syphilis was high in the troops from Canada and the Cape; among those from India, ague and diarrhœa were the prominent diseases, but in none was the prevalence of any disease so marked as to call for special notice. Of the 2 deaths on the passage from India, one was by *delirium tremens* and the other by dysentery. The third death in the Table was that of a private of 98th Regiment, by valve disease of the heart, on his passage from the Cape of Good Hope.

III. Troops proceeding from one Colony or Station to another.

Troops on Board Ship.

The number of men embarked to proceed from one Command abroad to another was, according to the Ship Returns, 5,756, representing an *annual* strength of 264. The admissions among them during their transit were 118, and the deaths 6, being in the ratio of 447 and 22·73 per 1,000 of mean annual strength.

The admissions and deaths by the different classes of diseases are shown in the following Table, framed from Abstract No. 27 in the Appendix :—

Order.	Diseases.	Between Canada, Bermuda, and the West Indies.				Between India and Ceylon.				Between Australia, China, Singapore, and Ceylon.			
	Stations												
	Number of Men Embarked	2,826				1,712				1,218			
	Average *Annual* Strength.	102				118				44			
		Admitted.	Died.	Ratio per 1,000.		Admitted.	Died.	Ratio per 1,000.		Admitted.	Died.	Ratio per 1,000.	
				Admitted.	Died.			Admitted.	Died.			Admitted.	Died.
	I. *General Diseases.*												
1	Febrile Group..	4	..	39·2	..	4	..	33·9	..	5	..	113·6	..
2	Constitutional „ ..	6	..	58·8	..	9	..	76·3	..	4	..	90·9	..
	II. *Local Diseases.*												
	Diseases of the—												
1	Nervous system ..	2	..	19·6	..	3	3	25·4	25·42	1	..	22·7	..
2	Eye	3	..	29·4	..	..	..	..	..	..	..	..	..
3	Ear	1	..	9·8	..	..	..	..	..	..	..	..	..
8	Respiratory System ..	4	..	39·2	..	3	..	25·4	..	1	..	22·7	..
9	Digestive „ ..	4	..	39·2	..	8	1	67·8	8·47	8	..	181·8	..
10	Urinary „ ..	1	..	9·8	..	8	..	67·8	..	6	..	136·4	..
11	Generative „ ..	..	..	..	..	1	..	8·4	..	..	..	..	..
13	Cellular Tissue ..	6	..	58·8	..	..	..	..	..	..	..	..	..
14	Cutaneous System ..	5	..	49·0	..	8	..	67·8	..	1	..	22·7	..
	III. *Conditions, &c.*												
	Debility	..	..	..	..	2	..	17·0	..	..	..	..	..
	IV. *Poisons* ..	1	1	9·8	9·80	..	..	..	..	..	..	..	..
	V. *Injuries.*												
2	Accidental	4	..	39·2	..	2	..	17·0	..	3	..	68·2	..
4	Self-inflicted	..	1	..	9·80	..	..	..	..	..	..	..	..
	Total	41	2	401·8	19·60	48	4	406·8	33·89	29	..	659·0	..

The admissions were not numerous in any of the groups comprised in this Table ; those by diseases of the urinary system in the third group were from gonorrhœa among the men of the 75th Regiment proceeding from Hong Kong to Singapore, and contracted at the former station before embarkation. The ratio of deaths was very high in the second group, from the occurrence of

3 deaths by sunstroke during and immediately after the embarkation of the 59th Regiment at Point de Galle for Bombay: all the men are said to have been hard drinkers, and to have been a good deal exposed to the sun previous to embarkation. The other death in this group was that of a man of the 96th, by acute dysentery, on the passage from Bombay to Calcutta. He was labouring under the disease when he embarked. In the first group 2 deaths occurred, one by delirium tremens in the 78th Regiment, between Quebec and Halifax, and the other in the 29th Regiment, suicidal by drowning, between Halifax and Jamaica. *Troops on Board Ship.*

IV. Invalids, &c., Returning to England.

The number of this class embarked was 5,278 men, of whom 3,086 were invalids, 1,342 time-expired men, and 850 effectives. They represent an *annual* strength of 751 men; there were 497 of them embarked as sick, and 614 cases and 68 deaths occurred during the voyage. The deaths have been accounted for under the different Commands from which the invalids were returning, and the fatal diseases will be found at the end of the Abstract in the Appendix for the various Commands.

XVI.—SUMMARY.

The following Tables show the principal results relative to the health of the Army at home and abroad in 1869, and the average of the nine preceding years:— *Summary*

SUMMARY, showing the Amount of Sickness, Mortality, and Invaliding, and the Average Number of Men constantly Non-effective from Sickness in the Army at Home and Abroad, during the year 1869.

WHITE TROOPS.	Mean Strength.	Admissions into Hospital.	Deaths.	Men sent Home as Invalids.	Discharged the Service as Invalids.	Average constantly Sick.	Annual Ratio per 1,000 of Strength.				
							Admitted into Hospital.	Died.	Sent Home as Invalids.	Discharged as Invalids.	Constantly Non-effective from Sickness.
United Kingdom	73,764	58,797	694	..	2,646	3,011	797	9·41	..	33·9	40·82
Gibraltar and Malta	9,660	6,203	77	256	196	321	642	7·97	26·5	20·2	33·23
British America	9,151	5,376	80	169	128	273	587	8·74	18·3	13·9	29·83
Bermudas	1,986	1,775	38	44	33	77	594	19·13	22·1	16·6	38·77
West Indies	1,734	1,467	25	33	19	69	846	14·42	18·7	11·1	40·37
Cape and St. Helena..	4,447	5,105	52	61	129	229	1,148	11·69	13·7	29·0	51·49
Mauritius	589	1,211	8	4	2	32·5	2,056	13·59	3·4	6·8	55·20
Ceylon and Straits Settlements ..	1,447	1,965	30	49	22	74	1,358	20·73	33·9	15·2	51·14
Australasia	1,773	1,283	11	33	22	69	724	6·20	18·6	12·4	38·91
China and Japan	1,249	1,604	17	63	29	82	1,284	13·61	50·4	23·2	65·65
India	55,988	89,140	2,080	2,314	1,052	3,285	1,592	37·15	41·3	20·6	58·67
On board Ship	2,893	1,722	19	..	..	..	595	6·57	..	..	..
Total	164,681	175,648	3,131	3,026	4,278	7,522·5	1,067	19·01	34·38	25·98	46·50
COLONIAL CORPS.											
Malta	547	437	3	..	..	..	799	5·49	..	..	..
West Indies	1,828	1,740	35	..	..	103	952	19·15	..	..	56·35
Western Africa	824	917	39	..	..	55	1,113	47·33	..	..	66·75
Ceylon..	943	477	10	..	24	23	506	10·60	..	25·4	24·39
China	895	533	20	27	..	..	595	22·34	30·17	..	..
Total	5,037	4,104	107				815	21·24			

Summary.

SUMMARY showing the Sickness, Mortality, and Invaliding, and the proportion constantly Non-effective from Sickness per 1,000 of Mean Strength in the Army at Home and Abroad during the nine years 1860–8.

	Annual Ratio per 1,000 of Strength.				
WHITE TROOPS.	Admitted into Hospital.	Died.	Sent Home as Invalids.	Discharged as Invalids.	Constantly Non-effective from Sickness.
United Kingdom	956	9·51	..	33·9	48·54
Gibraltar and Malta.. ..	811	11·60	22·6	16·6	42·55
British America	650	9·37	15·8	12·7	30·38
Bermudas	743	31·86	20·7	13·0	39·75
West Indies	1,107	16·59	28.9	16·9	44·02
St. Helena and Cape ..	955	10·69	30·9	20·2	50·09
Mauritius	1,024	21·01	42·8	16·9	44·97
Ceylon	1,417	23·06	21·0	21·6	67·43
Australasia	609	15·94	20·1	17·0	54·41
South China and Japan ..	2,021	39·25	62·8	23·7	86·27
India	1,591	27·05	39·2	18·2	63·15
On board Ship	739	13·49	..	..	..
Total	1,136	16·46	33·3	23·4	50·47
COLONIAL CORPS.					
Malta	844	8·78	..	..	..
West Indies	1,030	25·30	..	17·2	51·19
Western Africa	1,295	38·43	..		51·53
Ceylon	1,051	15·42	..	16·0	34·03
South China	1,578	28·00	31·4	..	51·13
On board Ship	1,298	16·05	..	..	..
Total	1,169	24·46			

Compared with the results for 1868 there has been a decrease in the admissions into hospital in both classes of troops, and there has been an increase in the mortality of the white troops to the extent of 4·21 per 1,000 of the strength, and also an increase in the proportion of invalids discharged the service; but there has been a reduction in the ratio of men constantly non-effective from sickness. In the colonial corps there has been a very slight increase in the mortality. The great increase in the death rate of the Europeans was almost exclusively due to India, the mortality having been lower than in 1868 at all the other stations except the West Indies, and the small number of troops employed there would scarcely affect the general average.

APPENDIX.

APPENDIX No. I.

REPORT ON HYGIENE FOR 1870.

By E. A. PARKES, M.D., F.R.S., Professor of Hygiene in the Army Medical School.

IT might have been supposed that the great war now raging would have given many lessons in Army Hygiene; and this doubtless will be the case when the records of the campaign are known. At present it is very difficult to collect anything either novel or important from the newspaper accounts. The war has been too rapid and too vast to permit those who are chiefly concerned to write much about it, but it is to be feared that its overwhelming proportions and its prodigious catastrophes and conflicts have been too much for the Medical Service of either Army. Deferring then, until next year, the discussion on this subject, I proceed to give as usual a short summary of some of the most important hygienic publications during the year 1870. I have given this year the largest space to the subject of sewerage, which continues to attract the greatest share of attention in this country, as it involves the interests not only of public health, but of agriculture, and consequently I have been obliged to shorten some other parts of the Report. The Reports on public health published this year, especially from India, are of great interest. Allusion to Dr. Cuningham's Report from Bengal, to Dr. Cornish's Report from Madras, to the Bombay and Dr. Hewlett's Reports, Dr. De Renzy's Report from the Punjab, and Dr. Bryden's very interesting Statistical Analysis of the Spread of Cholera, is made farther on. From America the Health Report of New York for 1868 has reached me. It is a thick volume of 635 pages, and contains an elaborate review of all the sanitary conditions of New York, and in addition a treatise on the cattle diseases of Texas, which is illustrated by several very beautiful plates. In the year ending October 1868 the mortality in New York was 25·45 per 1,000; of a total number of deaths of 25,459 there were 8,210 deaths of children under one year of age, or at the rate of 32·2 per cent. of the total mortality. This infantile loss is attributed to two great causes: impure air, and bad feeding, and in addition the great summer heat and the bitter cold winters both exert an unfavourable influence. A suggestion is made, which both for its originality and for its real practical merit is truly American. Looking to the immense difficulty of cleansing the low, crowded quarters of some parts of the city, and to the impossibility of rendering the air pure, and considering the immense advance in means of movement, and in practically lessening the distance between two points, it is suggested that instead of removing the filth generated by a dense population, it would be better to remove the crowded population itself to the neighbouring country, and to pull down the town houses, so as to open spaces and benefit the neighbouring houses. Railroads and steamboats to carry passengers quickly and cheaply through the city, "deserve," it is said, "approba-" tion and encouragement as the wisest of health measures." There is great truth in this, and it would be well if the immense crowd of small houses now erecting in the suburbs of London could be laid out on a good plan, with spaces and fields between them, and not allowed to be built in a way which merely reproduces in the suburbs many of the mistakes and disadvantages of the old city. Every point which can affect public health is discussed in this American Report with great care; water supply, markets, sewerage, conservancy, orphan asylums, &c., are all considered. In the summer of 1868, in hot weather, there was a great increase of mortality from diarrhœa, which had often a choleraic character; it was worst in the bad quarters of the town, and seems decidedly to have been checked by the liberal use of carbolic acid, and sulphate of iron.

This Report, like the former New York Report, can be strongly recom-

mended as a model of how such sanitary work should be done. Among the English official documents, the Statistical Report of the Health of the Navy for 1868, contains as usual much valuable information. It is a peculiarity of these naval reports that not only is the statistical evidence of the sickness and mortality of all the stations very clearly arranged, but almost every case of death or severe illness is carefully noted, and its probable cause is stated. In this way the attention of medical officers is not only directed to diagnosis, but also to the recognition of the origin of the disease, and the necessary preventive measures. A great impetus must in this way be given to the study of the prevention of disease among the naval medical officers.

Attention is directed by Surgeon Forbes, of the "Caledonia," to anomalous symptoms often presented by the young officers of his ship, and consisting of headache, heaviness, weariness, loss of appetite, &c., which seemed to proceed from the want of purity of air in the berths and gun room. The observations are of great importance. In the "Endymion" there was a case of enteric fever, attributable apparently to the use of the impure water at Jerusalem, where the man had been on leave. The frequency of tapeworm on the Mediterranean Command is noted, an observation of interest in connection with the supposed liability to entozoic diseases of the liver in the Malta garrison. An instance is recorded which fixes the inculcative period of cholera very closely in one case. The "Serpent" arrived at Surabaya, in China, where cholera existed, on the 3rd December, and leave was given for the men to go on shore on the 5th December. On the night of the 7th, at 11·30, a case of cholera occurred in a man who had just returned from the shore. Supposing the man went on shore at noon on the 5th, the incubative period could not have been more than 60 hours, and was doubtless less than this. An instance is given of the passage of malarious poison over half a mile of water. The "Pylades," with a healthy crew, anchored half a mile from the shore at Manzanilla, one of the most malarious places on the coast of Mexico. There was very little communication with the shore, except to get ten tons of cocoa nuts as fuel. The ship after remaining 2 days and 17 hours left on the 27th October. A case of intermittent fever was admitted on the 5th November; a second on the 7th; both these had been on shore. Then a man was admitted on the 8th who had not been on shore. Then from the 9th to the 15th November, 32 cases were admitted, 28 of whom had not been out of the ship, and consequently must have either got the disease from the wind blowing off shore (it had a marshy smell) or from the cocoanuts, which is unlikely. The longest incubative period was 18 days. Yellowness of the skin, and conjunctivæ was well-marked in some cases. Numerous other important observations are contained in the Navy Medical Report.

To pass from this general enumeration, the following is the order of arrangement:—

Water.
Air.
Food.
Climate.
Sewerage.
The Specific Diseases.
Scarlet Fever.
Enteric Fever.
Cholera.
Intermittent Fever.
Typhus in India.
The Nature of Contagion.
Parasitic Origin of Disease.

WATER.

Water of Marshes.—Dr. M. P. Balestra states* that on examining the water of the marshes of Pontius, of Maccarebe, and of Ostia, these were found to be filled with infusoria of different kinds (Busariens, Trichodiens, and Vorticelliens). But there was one plant which attracted attention by its abundance in the marsh water, and was always in proportion to the putrefaction of the infusoria.

* Comptes Rendus, 1870, tome lxxi., No. 3, July, p. 235.

This was a little plant, a "microphyte granule," belonging to the algæ, of a constant and special form something like that of the "Cactus peruvianus." It was always mixed with a considerable quantity of little spores, $\frac{1}{1000}$ mill. in diam., greenish, yellow, and transparent, also with sporangia or vesicles containing the spores of $\frac{2}{1000}$ to $\frac{3}{1000}$ mill. in diameter. It floated on the surface, and when young was like drops of oil. Cold checked its growth. Exposed to air and solar rays it grew quickly in disengaging little bubbles of air.

Solution of arsenious acid, sulphite of soda, and neutral sulphate of quinine checked its growth.

These spores and sporangia could diffuse in the air. If the water in the air was condensed by ice, it was found to contain something organic, which coloured gold chloride violet on boiling. The microscope found granules coloured by iodine, but especially quantities of these spores, and sporangia.

In the air of Rome and its vicinity these spores are easily recognized.

The gases escaping from the marsh waters are "acide sulphydrique, acide "carbonique, and hydrogene protocarbone."

Balestra thinks these spores are the cause of the marsh fever, or contain the poison.

The algæ is not produced in daytime, but will arise after slight rains, and even in mists and heavy dew. Hence the author explains the development of fever at Rome in August and September. The winter cold checks the development of the algæ.

Ritter* attributes the malarious disease in the Elbe marshes in part to the bad water.

Besides malarious disease, the water, which was very salt, produced "catarrh of the stomach."

Mr. Dickson, in Dr. De Renzy's Report on the Sanitary Condition of the Punjaub in 1869 (Appendix I.), describes a severe outbreak of dysentery and diarrhœa in the Dharmsala gaol. The disease had been frequent in the gaol for several years, and had been attributed to various causes, such as scurvy, changes of temperature, diet, age of the prisoners; all of which presumed causes were proved to be insufficient. Mr. Dickson has succeeded in tracing it to the use of impure water, and he narrates one very obstinate case in which a cure was easily effected by boiling the drinking water.

Dr. Buchanan, in Mr. Simon's 12th Report (p. 72) narrates an outbreak of enteric fever at Wicken-Bonant, in Essex. There are in the parish one public and several private wells. Among 118 persons using the water from the private wells there was only 1 positive case of typhoid fever. Among 88 persons who used the public well there were no less than 42 cases. It was made out that the stools from a typhoid patient were thrown into a privy which stands almost on the edge of the water channel, and 35 yards above the parish well, the water in which stands somewhat more than 30 feet from the surface; the soil is sandy clay and gravel resting on chalk. At the time when the stools were thrown into the privy the soil water was falling, and there is no doubt the sewage could reach the well. The water was examined by Dr. Miller, and contained per gallon 2·15 of volatile matters, ·56 of nitric acid ($N_2 O_5$) ·003 of free and ·008 of organic ammonia. Examined microscopically by Dr. Sanderson the sediment was found richly peopled with microzymas and two species of monads and paramecia.

A month after the stools had got into the well water the drinkers of this water began to be attacked. "There can be no doubt," writes Dr. Buchanan, "that the epidemic prevalence of the disease was caused by the stools getting, "with their specific poison, discharged into the parish well." (p. 75.)

Dr. Druitt† relates a good case in which the water of a large iron tank in a school stood over a large apartment arranged as water-closets and urinals for 100 boys, and where there was usually an abominable odour. The water absorbed so much ammonia that, whereas the Waterworks Company's water contained in 1,000,000 parts only ·01 of free ammonia and ·08 of albuminoid ammonia, this tank water contained in 1,000,000 parts ·37 of free and ·17 of albuminoid ammonia.

* (Quoted by Hirsch) Jahresbericht für Ges. Med. for 1869 (1870, p. 192).

† "Medical Times and Gazette" Sept. 18, 1869.

In the Bombay Report many good analyses by Dr. Lyons are given, proving the almost universal contamination of the Bombay stations' water with sewage.

Air.

Dust as a Ferment.—Mr. Tichborne has published* some analyses of the street dust of Dublin, and has made some experiments to show that this dust acts as a ferment, and to measure the amount of its action in this way. As regards the first point, the dust from Grafton-street contained 68·9 parts of inorganic and 31·1 parts of organic matter per cent., which last contained 1·07 of nitrogen and 43·7 of carbon. From Nassau-street the dust contained 45·2 per cent. of organic matter. The organic matter was stable manure finely ground. The dust from the gallery of the Theatre Royal Dublin contained 53·2 per cent. of organic matter, and that from the top of Nelson's Pillar (134 feet) contained 29·7 per cent.

As respects the fermentation test, advantage was taken of the fact that during fermentation the nitrate of any base is reduced to a nitrite. Nitrate of potassium was, with suitable precautions, added to the mixture containing the dust, and the resulting nitrite determined by sulphuric acid and iodide of potassium and starch ,and then by decolorising with a volumetric solution of hyposulphite of sodium. By this means a quantitative determination of the amount and activity of the fermentation was given. Dust from Nelson's Pillar (134 feet from ground) was found to be a most active ferment. The hyposulphite was of such a strength that 1 degree was equal to ·81 grain of nitrate reduced to nitrite. On the second day, with 1-2000th part of this dust 3·5 degrees of hyposulphite were used for 5 c. c. of the fluid ; on the third and fourth days 4 and 7 degrees, and on the sixth and seventh days 8·5 degrees were used. Other dust gave similar results.

The extreme lightness of the dust is shown, according to Mr. Tichborne by the fact that even when the vessel containing the dusty air is placed under the air-pump a large proportion floats.

Food.

Dr. Letheby has published the "Cantor" Lectures on Food in an enlarged form, and it will be found to be a very useful and instructive work. A work by Jules Cyr† is far inferior, but contains some observations of value on food in sickness, especially of the use of raw meat, which has now become rather ashionable in phthisis. Recommended strongly, when mixed with alcohol, by Dr. Fuster, of Montpellier, in 1865, it was tried by several physicians with some benefit. M. Cyr has seen it do good in lessening the perspiration and in reducing the pulse and fever. He notices also the employment of whey and of "koumiss" in phthisis, but gives no opinion of their value.

Preserved Foods.—The demands of war have, as usual, exercised the ingenuity of inventors, and many kinds of preserved food have been proposed. It is known that for several years the Prussian War Office has paid great attention to this subject, and that many experiments have been made. The following quotation from the *Times* may be of interest :—"The *Weser Zeitung* gives "a description of the manufactory of Prussian army stores at Berlin. More "than 1,700 persons, adults and youths, of both sexes, are engaged from "morning till night in preparing 150,000 lbs. of peas-pudding (*erbswurst*,— "literally pea-sausage) and 240,000 rations of meat and vegetable preserves, "which are daily despatched by railway. The largest room in the building is "devoted to the preparation of peas-pudding. Swine's flesh, especially bacon "and hams, are first cooked in 12 large saucepans. The other components of "the sausage are pea flour, salt, and the so-called '*lupus*,' the name humorously "given by the inventor to the secret ingredient which make the article keep "and gives it an agreeable flavour. When the mixture is cooked, it is poured "into pails, and by skilful kneading the pea sausage soon becomes firm, and is "enclosed in a covering, not of skin, but of parchment. Boys and girls carry "the mixture on wheelbarrows to the packing-room, where 400 women and

* "Chemical News," Oct. 21, 1870.
† Traité de l'Alimentation. Paris, 1869.

"girls, after cleansing the outside from grease, affix on every portion the "following label:—'Put 10 ounces, or one-third of a sausage, freed from the "'coating, into 1½ pints of cold water, stir it up, and let it cook for 10 "'minutes.' The sausages are carefully packed in pairs, and are sent to the "coopers' workshop, where they are stowed into 150 lb. chests, nailed up, and "sent off. The sausage or pudding becomes in time as hard as stone. The "genuine article is not obtainable by the public, though imitations of it are "sold. Turnips, carrots, and celery for the preserves are dressed and cut by "about 120 women. The tin cases of the preserves employ 120 workmen; "100 oxen are daily slaughtered, and 275 cwt. of bacon daily bought for the "manufactory. The preserves, already soldered up in cases, are boiled in the "so-called marine baths. Labels with directions are placed on every case. "Everything is made the most of, the bones being cooked and supplying "excellent broth. Eighteen saucepans are used for preparing '*gutlasch*,' a "mixture of beef and maize, which is much relished by the troops. The "works cover about six acres, and are now the property of the State. There "are similar establishments at Frankfort and Mayence."

I have analyzed this pea-sausage, and found it to contain in 100 parts, 16·2 of water; 7·19 of salts; 12·297 of nitrogenous matter; 33·65 of fat; and 30·663 of starch, &c. The chief point is the great amount of fat; a ration of 6 ounces contains 2 ounces of fat, and if 3 rations are taken daily, more than 6 ounces of fat are taken. This must be excellent diet in this respect for men undergoing great exertion.

Milk.—A paper on the analysis of milk, by Dr. A. E. Davies, contains an interesting observation. The range of the specific gravity of milk at 60° Fah. seldom goes below 1026, and practically 1026 may be taken as the minimum. But occasionally, from a great amount of fat, the specific gravity may be below this, and Davies gives an example. The composition was—

Cream	4·26
Fat	6·26
Sugar	5·13
Salts	·6
	16·25
Water	83·75
	100·00

The cream, as determined in the usual way, was 17 per cent. The specific gravity was only 1024·6. Such cases as these could hardly mislead if the specific gravity is compared with the percentage of cream, but Davies makes an useful suggestion, viz., to take the specific gravity of the "serum," or liquid portion of the milk after coagulating or straining. He says the specific gravity is remarkably constant, ranging from 1026 to 1828. Anything below 1026 would, therefore, indicate the addition of water. It would be well to have a sufficient number of analyses to confirm this rule.

Climate.

Dr. Rattray, of the Royal Navy, has made* some observations on the pulses, respiration, and temperature of sailors at home and in the tropics. The experiments form an important addition to our knowledge of the effects of climate. His chief conclusions are as follows:—

Effects of Heat on Respiration.—Spirometer in 12 adults. Average in June in England, temperature 65° = 256 cubic inches; 19 days after, in the equatorial doldrums, 78° in the shade = 280 cubic inches.

In 10 of the 12 cases the amount was still further increased by an average of 6½ cubic inches, by prolonged residence.

After return to England there was a decrease in every case of 26 cubic inches.

Subsequently, when the temperature in England fell to 42° in February, the average amount fell to 253 cubic inches.

* Proceedings of the Royal Society, 1870.

The capacity of the chest for air is therefore considerably greater in the tropics than in temperate climates. The same law extends to the Negro.

The vital capacity in a Negro fell from 210 cubic inches in the tropics, to 156 cubic inches in the English winter The same effect was found in phthisical invalids.

Time of day produces no effect.

Frequency of Respirations :—

In England, with 62° average....	15⅝
In Tropics, going out	12¼
„ coming home	13⅝
In winter, in England, after return	16½
At freezing-point	17½

Another case is given, which is similar :—

"We find from these data that the increased quantity of air inspired in the "tropics does not make up for the diminished number of respirations in "supplying the same amount of air and oxygen for blood purification as in cold "climates."

	Cubic inches each respiration.	No. of respirations.	Cubic inches per min.
England	15	17	255
Tropics	16·836	14	235·704

Also, the less proportion of oxygen in tropical air still further lessens the "decarbonizing capabilities of the lungs."

Rattray calculates the difference of carbon thrown out by the lungs in the tropics, as compared with a temperate climate :—

	ozs.
Temperate	10
Tropics....	8·909
Difference	1·091

The explanation, he thinks, is that there is no increase in the size or capacity of the chest and enclosed lungs, but only an alteration in the relative proportion of blood and air in the lungs.

In tropical, as in temperate climates, the respirations are less frequent in the morning and augment as the day advances, but this is not so marked in the tropics as in temperate climates.

Average pulse in tropics is lower by 2½ beats than for the temperate zone. The pulse is therefore reduced in the tropics. But Rattray remarks that the observations were only on one person.

Temperature of the Body :—

England	98·3
Tropics (average of 51 days)	98·66
Equator, temperature 84° (average of 7 days)	99·02

The highest temperature in the tropics was at 3 P.M. (this was not from food or muscular activity). The temperature was 99½° and 100° in 22 per cent. of the observations.

There is a gradual, though trivial, increase in the temperature of the body in proportion to the increase in the external air.

The result is in accordance with some experiments made by Dr. Becher (Army Medical Staff) which are not yet published, but which show that a rise of external of temperature of 1° raises the body heat by 1-20th of a degree of Fahrenheit.

Sewerage.

The Franco-Prussian War appears for the time to have stopped all the contemplated drainage works in Germany, and the attention of writers is directed to more exciting themes. In this country the discussion still goes on, and the "First and Second Reports* of the Commissioners appointed to "inquire into the best means of Preventing the Pollution of Rivers" gives us in every sense of the word weighty evidence on this subject. The Commissioners are Sir William Denison, Dr. Frankland, and Mr. Morton, and the scope of their instructions is very large.

As might be expected, the Reports before us deal very largely with chemical results; indeed, the bulk of the matter must have been given by Dr. Frankland. The analyses are almost innumerable, and are arranged according to the plan devised by Frankland, and which has been the subject of such sharp criticism. The following are the chemical points determined in river or sewage waters:—1. The total solid matters in solution. 2. The organic carbon (*i.e.*, the carbon in organic matters and not existing as carbonate, &c). 3. The organic nitrogen (*i.e.*, the nitrogen existing in organic matter and not as ammonia, nitrates or nitrites). 4. Ammonia. 5. Nitrogen as nitrates and nitrites. 6. Total combined nitrogen (*i.e.*, the total nitrogen in all the constituents). 7. Chlorine. 8. Hardness (temporary, permanent, and total). All are given in parts per 100,000.

All the results being arranged on this plan are easily comparable, and whatever may be the objections against Dr. Frankland's method as a mode of hygienic water analysis, there can be little doubt that used as he has used it, it affords a means of comparison between different waters, which is more precise than that afforded by the ordinary mode of statement.

Using, then, this plan, the River Commissioners have examined the rivers in the Mersey and Ribble basins, have determined the origin, &c. (as far as their plan reaches), the source and amount of contamination, and the best means of dealing with it. Their enquiry has led them to consider fully the modes of disposal of sewage; and in fact this question is the most prominent one in their Reports. The Reports are sure to become well-known to every sanitarian, but a few matters of interest may be selected from them.

River pollutions are broadly divided into "sewage" and "manufacturing refuse." Under the former term is included not only the solid and liquid excreta of men and animals, but the house and wash water, and in fact all impurities coming from dwellings. Under the term manufacturing refuse are pollutions by—(1. Dye, paint, and bleach works. 2. By chemical works. 3. By tanneries. 4. By paper making. 5. By woollen works. 6. By silk works. In other regions there would, of course, be other sources, such as metal works, breweries, &c.

These pollutions, whether sewage or manufacturing, passing into rivers are not got rid of very rapidly; in other words, the Commissioners deny the alleged self-purification of rivers. One example, taken from several others, may suffice. The Irwell river, after passing Manchester, runs 11 miles to its junction with the Mersey without further material pollution, and with but trifling augmentation from unpolluted affluents. In this course it falls over six weirs, giving a total height of 34½ feet, and is abundantly covered by foam for some distance below each weir.

Composition of Irwell Water in 10,000 parts.†

	Total Solids.	Organic Carbon	Organic Nitrogen.	Ammonia.	Nitrogen as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Suspended matters.
Before the runs of 11 miles ...	44·6	2·104	·248	·230	0	·437	7·4	2·80
After the runs of 11 miles ..	43·1	2·009	·304	·338	0	·582	6·8	1·44

* Blue Books, 1870. Vols, I., II., III.

† To bring the number into grains per gallon multiply by ·7.

Not only, then, is the composition tolerably constant, but it will be observed that there is actually no trace of conversion into nitrates and nitrites; and the other analyses are confirmatory. Still it may be said the pollution of the Irwell represents not only sewage but chemical pollution, and the self-purification by flow and oxidation has only been alleged of the former. To test this the Commissioners took average London sewage, filtered it, and mixed it with 9 volumes of water of a temperature of 20° C. It was then exposed to light and air, and syphoned daily from one vessel into another, falling through 3 feet of air, so as to represent a flow of 96 and 192 miles at the rate of 1 mile per hour. The following gives the result (in 100,000 parts):—

	Organic Carbon.	Organic Nitrogen.	Percentage Reduction.	
			Organic Carbon.	Organic Nitrogen.
Original	·267	·081	..	..
After flow of 96 miles	·250	·058	6·4	28·4
After flow of 192 miles ..	·200	·054	25·1	33·3

There is here more oxidation than in the former case, but the length of flow is 9 and 18 times greater, and after all the oxidation is not considerable.

The point was also investigated by determining the amount of the dissolved oxygen in water containing sewage, but excluded from air.

Weight of dissolved Oxygen in 100,000 parts of Water and Sewage.

Immediately after mixture.	After 24 Hours.	After 48 Hours.	After 96 Hours.	After 120 Hours.	After 144 Hours.	After 168 Hours
·946	·803	·616	·315	·201	·080	·036

Of course here the rate of lessening of the oxygen, which could not be renewed, was different from what would be the case in a flowing river; but assuming that the oxygen was replaced, and that the oxidation went on at its maximum rate, 62·3 per cent. of the sewage would be oxidised in 168 hours (= 1 week).

Of course it may be a question whether these experiments answer all the conditions of a flow in streams, but they seem to prove that the oxidation of sewage animal matters takes place slowly; and the Commissioners calculate that, so far from sewage mixed with 20 times its volume of water being oxidized in a flow of 10 or 12 miles, scarcely two-thirds would be so oxidized in a flow of 168 miles in a week. There is, they believe, no river in England long enough to effect the destruction of sewage by oxidation. In the flow of a river, however, great purification from suspended matters takes place by subsidence, and the action of plants also absorbs dissolved matters, so that oxidation alone is not the only purifier.

The Commissioners then take specifically the pollution of rivers by sewage, and enter upon a comparison of the Lancashire midden system and water sewerage, which, as they put it, is very much to the disadvantage of the former. They deny that the midden system secures soil, water, or air from contamination; and they consider the plan wasteful, expensive, and tardy. In fact their Report may be taken to be as strong a condemnation as could be made of the midden system, as distinguished from the dry-earth system.

While on this subject, they give a Table of the weight of the solid and liquid excrements of 100,000 persons. The numbers are taken apparently from rather old analyses.

WEIGHT in Cwts. of the Excrements of 100,000 Persons per Annum.

	Fœces.	Organic Nitrogen.	Phosphates.	Urine.	Organic Nitrogen.	Phosphates.
Men (37,610)..	40,372	468	881·	403730·2	4,037	1,638
Women (34,630)	11,045	250	268·2	334541·	2,653	1,354
Boys (14,060)..	11,067	183	161·8	57354·2	481	217
Girls (13,700)..	2,453	56	36·	45012·	360	171
Total (100,000)	64,937	957	1347·0	840637·4	7,531	3,380

The proportion of the fœcal excreta assigned to women and girls seems small, that for men and boys rather large. Calculating per head and per day, the excretion would be for each person very nearly 3 ounces of fœcal and 2·6 lb. by weight, or very nearly 40 ounces, by measure, of urine.

After this follow two valuable Tables of the composition of sewage from towns under the midden system (*i.e.*, of the fluid taken from the sewers which carry off the house-water and often drain the middens), and of the sewage from watercloset towns. They show that the middens do not keep the sewers from receiving excrement. It is noted that London sewage is now considerably more dilute than when analysed by Hofmann and Witt some years ago.

The average of all the samples of sewage from various towns, gives for the total combined nitrogen 7·728, and for the chlorine 10·66 per 100,000 parts. The average ammonia amounts to 6·703, and the nitrogen in the nitrates and nitrites only to ·003 parts in 100,000.

With regard to the remedies for the pollution of rivers by sewage, this leads at once to the great question of the day. The Commissioners allude first to what they call "preventive processes." These are the privy and ashpit system in its various forms; the dry-earth closet, which they saw in capital action at Halton; the Eureka system, now given up; and the Goux system, which differs chiefly from the Eureka plan in the mode of collecting and subsequent dealing with the sewage, which is not dried by heat, but is allowed to ferment with the drying or absorbent material (dust, chaff, ash, &c.) used in the collection. All these plans the Commissioners pronounce "inefficient."

They then consider the plans for purification of sewage, dividing them into three heads:—

(1) Purification by chemical agents. These are lime alone; Sillar's compound (A, B, C,—viz., alum, blood, clay, and charcoal, &c.); lime and chloride of iron (= Northampton process); Bird's process (crude sulphate of alumina); and Holden's process (sulphate of iron, lime, and coal-dust). Many experiments are given of all these plans, from which it results that none are perfect purifiers, that all are useful to a certain extent, but that none satisfy all the requirements. Sillar's (the A, B, C) process seems to be the best of the five, but in the second Report it is subjected to a very searching examination, with the result of showing that it is not an efficient purifier.

(2) Purification by filtration. The Commissioners examined the upward filtration process carried on at Ealing, and found that the filtering material was insufficient in quantity (only 60 cubic yards instead of 40,000), and was not properly aërated.

They then give some experiments to show what filtration through sand will do, both on the upward and continuous and the downward and intermittent plans, by which the sand is aërated. The former is far less efficient than the latter. When, with the latter plan, the amount of filtration was in each 24 hours, 5·6 gallons of sewage per cubic yard of filtering material, the result was satisfactory, the organic carbon being reduced from 4·386 parts to ·734 parts, and the organic nitrogen from 2·484 to ·108 parts, and the ammonia from 5·557 to ·012 parts in 100,000. Nitrates and nitrites did not exist before

filtration, but were found in large quantity (3·925 parts of nitrogen as nitrate and nitrites) afterwards. When the sewage was doubled, viz., 11·2 gallons in 24 hours per cubic yard, the results were less satisfactory. Sand and chalk gave results almost as good.

Experiments of the same kind were made with a natural soil taken at Beddington near Croydon, and consisting chiefly of silica, with a little alumina and lime. The sewage was purified very rapidly, and the conversion into nitrates and nitrites went on satisfactorily, even when the sewage reached 7·6 gallons per cubic yard of soil in 24 hours. When this rate was doubled, nitrification ceased, and the soil became clogged.

In other soils, however (Hambrook and Barking), the process of nitrification went on very slowly or not at all. The soil arrested, but did not oxidize; and this is obviously a most valuable soil for irrigation in an agricultural point of view, but not so good as a purifier of sewage water. In the Barking soil, after 12 weeks, the sewage water passed out almost as it entered. The Barking soil contains 77·65 per cent. of silica, 4·96 of alumina, and 2·68 of lime. There is no obvious reason why it should not have had a power of oxidation equal to the Beddington soil.

The Dursley soil, containing 42·89 of silica and 18·41 of peroxide of iron, surpassed all others in its purifying effect; 1 cubic yard purified 9·9 gallons in 24 hours.

This power of purification is thought to depend more on physical than chemical conditions. May not the iron, however, have had an effect?

Peaty soil is not so good.

This plan of filtration of sewage is therefore usually efficacious, and a small portion of land might receive a large supply of sewage; but the fertilizing properties are lost, for no crop can be grown on the filter, and the plan might in summer become a nuisance.

(3) Purification by irrigation. Irrigation differs from filtration not only in the amount of land being much greater, but in an agricultural result being obtained; but of course in this process filtration is also the active agency. There is in part arrest of the sewage, and in part oxidation. For 100 people, the Commissioners allow a gently sloping square of 70 yards, and the 2,000 gallons of sewage water derived from these persons are supposed to trickle 70 yards down the slope in 24 hours. The quantity delivered per hour need not be more than half a gallon for every lineal foot across the slope, and this half-gallon need not travel faster than 8 feet per hour in order to traverse the land within the day.

Intervals of rest are however needed by the land, which will only bear this liquid dressing one day out of every three or four days.

The Commissioners unhesitatingly adopt this as the proper plan of dealing with sewage, and preventing the pollution of rivers; and they give numerous analyses showing the purifying power of land properly prepared for irrigation.

Details are given of sewage irrigation at Edinburgh, Lodge Farm near Barking, Aldershot Farm, Carlisle, Penrith, Rugby, Banbury, Warwick, Watling, Bedford, Norwood, Croydon, and Woking. The chemical experiments in all these cases are by far the best yet made. The purifying effect varies, yet is in most cases very great. For example, at Aldershot, on one occasion, the total combined nitrogen was reduced from 13·444 to 1·933, and this included 1·312 escaping as nitrates and nitrites; at Penrith, the total combined nitrogen was reduced from 10·460 to ·109 parts per 100,000; at Rugby, from 8·314 to ·510. The Commissioners affirm that the old method of chemical analysis, when the loss by irrigation was termed organic matter, although it included nitrates and nitrites, gave no real idea of the purifying effects of soil, and they give (p. 95) a Table which it may be useful to reproduce.

RESULTS of Irrigation, in Parts per 100,000.

	Percentage of dissolved Organic Pollution removed.		Percentage of suspended Organic Pollution removed.
	Organic Carbon.	Organic Nitrogen.	
On fallow land at Chorley (adhesive loam) ..	62·3	70·2	100·
At Edinburgh (both sand and clay)	45·3	81·1	84·9
Barking (gravelly soil)	65·8	86·2	100·
Aldershot (light sand):			
Best result	91·8	87·3	99·7
Worst result	69·9	82·9	87·7
Average result	80·9	85·1	93·7
Carlisle (light loam)	77·9	59·8	100·
Penrith (light loam)	75·0	77·2	100·
Rugby (adhesive soil)	72·3	92·9	96·0
Banbury (principally clay):			
Best result	87·8	91·3	96·0
Worst result	64·1	80·1	90·3
Average result	76·	85·7	93·2
Warwick (stiff clay)	71·7	89·6	100·
Worthing (loam)	42·7	83·5	100·
Bedford (light gravelly soil):			
Average result	71·6	81·3	100·
Norwood (clay):			
Average result	65·0	75·1	100·
Croydon (gravelly soil):			
Best result	73·2	93·2	100·
Worst result	61·7	90·4	100·
Average result	67·4	91·8	100·

These results are much better than those of any chemical precipitant, the best result of the lime process giving a removal of only 65·8 per cent. of the organic nitrogen, and the best result of Sillar's (A, B, C.) plan giving only a percentage of 58·9. They are not quite so good as the downward filtration plan, but the difference is not great.

AVERAGE RESULTS.

	Percentage of dissolved Organic Pollution removed.		Percentage of suspended Organic Impurity removed.
	Organic Carbon.	Organic Nitrogen.	
Chemical processes	28·4	36·6	89·8
Upward filtration	26·3	43·7	100·
Downward filtration	72·8	87·6	100·
Irrigation	68·6	81·7	97·7

The Commissioners, relying on these chemical results, and looking also to the element of agricultural utility, decide for irrigation; but before doing so, they adduce evidence as to *influence of sewage irrigation on health.*

From the evidence of Edinburgh, Norwood, and Croydon, they decide that no danger is produced. They also determined, by experiments, the loss of ammonia by evaporation during the conveyance of the sewage, and decide that this is immaterial. They have not yet made sufficient experiments on the loss of ammonia by putrefaction, but conclude that there is no fear of such loss in 24 hours, even in the warmest summer weather.

Such is an abstract of the main facts of this Report, as far as sewage is concerned. With regard to trade or manufacturing pollution, the Report is less full, and possibly the mode of stating the chemical results is less useful. Many waters thus polluted can be purified by subsidence, with or without chemical addition, and by filtration. In some cases, special methods of dealing with the refuse water are necessary, but for all these points we must refer to the Report.

There is also much information on the supply of water to the large towns in Lancashire, with many analyses.

In conclusion, the Commissioners give a standard of impurity, which, if reached, should preclude liquids being discharged into streams. This standard being based on Frankland's process, necessarily requires all future analyses to be made in Frankland's method, in order to see if the standard is exceeded. This being understood, the following are deemed polluting and inadmissible nto any stream :—

(*a*) Any liquid containing *in suspension* more than 3 parts by weight of dry mineral matter, or 1 part by weight of dry organic matter in 100,000 parts by weight of the liquid.

(*b*) Any liquid containing *in solution* more than 2 parts by weight of organic carbon, or ·3 parts by weight of organic nitrogen in 100.000 parts by weight.

(*c*) Any liquid which shall exhibit by daylight a distinct colour when a stratum of 1 inch thick is placed in a white porcelain or earthenware vessel.

(*d*) Any liquid which contains *in solution*, in 100,000 parts by weight, more than 2 parts by weight of any metal, except calcium, magnesium, potassium, and sodium.

(*e*) Any liquid which, in 100,000 parts by weight, contains, whether in solution or suspension, in chemical combination or otherwise, more than ·05 part by weight of metallic arsenic.

(*f*) Any liquid which, after acidification with sulphuric acid, contains, in 100,000 parts by weight, more than 1 part by weight of free chlorine.

(*g*) Any liquid which contains, in 100,000 parts by weight, more than 1 part by weight of sulphur, in the condition either of sulphuretted hydrogen or of a soluble sulphuret.

(*h*) Any liquid possessing an acidity greater than that which is produced by adding 2 parts, by weight, of real muriatic acid to 1,000 parts, by weight, of distilled water.

(*i*) Any liquid possessing an alkalinity greater than that produced by adding 1 part, by weight, of dry caustic soda to 1,000 parts, by weight, of distilled water.

It is difficult at present, until more analyses in Frankland's method have been made, to give an opinion on the chances of this standard being adopted by the Legislature when the Report has to be transformed into law. Probably it will give rise to great discussion.

By the side of this elaborate Report, all other contributions to the sewerage question appear small, yet there are several of much value.

In the "Medical Press and Circular," a series of papers on the "Sewage Question" have been published.* It is stated that Dr. Letheby placed all his notes on the condition of the sewage farms at the disposal of the compiler of the papers, and it is evident that the statements carry with them Letheby's authority.

They may be said to be greatly opposed to the conclusions of the Rivers' Pollution Commissioners. The account given of the purifying effects of the farms at Aldershot, Banbury, Warwick, Croydon, Rugby, &c., is unfavourable; while on the other hand the effects of chemicals, especially lime, in producing precipitation are much more highly rated. It is difficult indeed to reconcile Dr. Frankland's and Dr. Letheby's results. Even when allowance is made for a difference in method of chemical examination, and of the statement of results, the discrepancy is so great as to show that one side must be in error.

Dr. Letheby finds all the sewage farms offensive sodden fields, with the affluent water frequently as impure as the sewage itself, and the pecuniary results unfavourable†. This is however much opposed to the evidence of others. The chemical analyses are given in grains per gallon, and comprise—1. Solid matter in solution; 2. Chloride of sodium; 3. Organic matter (how this is determined is not stated); 4. Ammonia; 5. Organic ammonia (*i.e.*, the albuminoid ammonia of Wanklyn and Chapman); 6. Nitrogen, as nitrates, &c.; 7. Oxygen required to oxidize; 8. Matters in suspension,—viz., organic and mineral.

This method of statement appears useful and complete, and it has this great advantage over that of Frankland, that the processes giving it are much more simple and expeditious.

As a contrast between the two methods, we may select the Aldershot farm affluent water. In Frankland's analyses, 85 per cent. of the organic nitrogen was found to be removed. In Letheby's best result, the "organic" (*i.e.*, albuminoid) nitrogen was reduced from ·94 to ·48 grains per gallon, or 51 per cent.; the ammonia from 7·54 to 5·04; there was no oxidation to nitrates and nitrites. At Rugby, Worthing, and other farms, the purifying effect is also given far below that stated by Frankland. It is also stated that in many cases the outflowing sewage water is so diluted with subsoil water as seriously to interfere with the power of estimating correctly the purifying power of the land. In some cases, as at Croydon, however, the purifying effect was more satisfactory. One point may in part account for the discrepancy, viz., that Dr. Letheby's analyses seldom include more than the water of a single day, while Frankland's were often repeated. Still this does not sufficiently explain the difference.

A very interesting account is contained of the precipitating processes, and a list is given of all the patents from 1762 to 1858. They are 57 in number, but many are mere repetitions.

* "Medical Press and Circular," August, September, October, November, and December 1870.

† A writer in the "Lancet," October 22, 1870, has strongly questioned Letheby's assertions about Aldershot, and affirms that the "farm is a marvel of success."

The effect of caustic lime and chloride of lime (3·43 grains of lime and ·33 grain of chloride of lime per gallon), as practised at Hertford, gave very fair results, but the amount of lime was too small. Letheby advises it should not be less than 12 grains per gallon of sewage; be perfectly caustic; well slaked, and got into a finely-divided or creamy state; be thoroughly mixed with the sewage and well agitated, and allowed to settle for an hour.

In 1867, Drs. Frankland, Letheby, and Odling, recommended that the proportion of lime should not be less than 1 ton, and of chloride of lime 56 lbs. per 1,000,000 gallons of sewage.

The salts of alumina are also well spoken of by Letheby, especially Manning's and Lenk's processes. Lenk's solution contains 12 per cent. of alumina, and a gallon of London sewage requires 24·5 grains, by weight, to clarify it.

These analyses of Letheby and Frankland, in respect of the precipitating agencies, are more in accord than those on irrigation. The effect of Letheby's remarks certainly leads to the impression that Dr. Frankland may have underestimated the practical value of these processes as purifiers, especially when irrigation cannot be well performed. Commercially, none of the precipitating processes have yet proved successful.

The subject of sewage irrigation is treated by Dr. Carpenter, of Croydon,* who has had great experience of this subject. By sewage irrigation, Dr. Carpenter does not mean using the land as a filter, but as a producer of crops. The sewage should, he thinks, run *over* and not *through* the ground, and should not penetrate more than a few inches into the soil. If there is no crop, the sewage should not be applied in excess of the storing power of the soil. The limit of this power is, however, not always easy to seize, nor does Dr. Carpenter very clearly define what he means.

Dr. Carpenter believes that 100 acres are sufficient for both sewage and rainfall of a district containing 10,000 persons. In some cases, the rainfall must be separated. He has found ozone in some quantity in the air of the sewage meadows when there was none in the town; he has not been able to trace any impairment of health in those who live even close to the sewage farm; the cattle on the farm are perfectly healthy, and give good milk and butter. All the statements made in an opposite sense are erroneous. At Croydon, sewage irrigation is carried on even during frost. The sewage had an average temperature of 41° Fahr. at Norwood, while the air temperature ranged between 10° and 33°; at Croydon, the sewage temperature was 57°, while the air temperature was between 31° and 24°.

With respect to the influence of sewer gas on public health, Dr. Carpenter traces to it not only typhoid fever (in the production of which he says sewer gas is one of the factors), but diarrhœa, dyspepsia, palpitation of the heart, asthma, convulsions in teething infants, and headaches. He states that milk fever, abscesses in the breast, and phlegmasia dolens after delivery, have been less frequent in Croydon since the drainage. He traced so many cases of illness to sewer gases, dependent on defective sewer ventilation, that now every new house is compelled to have ventilation for sewers for itself. This is done by continuing the soil-pipe upwards in a straight line above the level of the pan between the trap and the sewer; it is not curved or turned at right angles; it opens under the eaves of the house, away from chimneys and windows. Every trap in a sewer is also guarded by a pipe which is placed as close to the trap as possible. Dr. Carpenter indeed concludes that it is better to "ventilate but not to trap," but why not do both?

Another communication of great interest on this subject is on the utilization and purification of the sewage of Paris, by Mr. Sandford Moore, Assistant-Surgeon, 4th Dragoon Guards.†

The sewage of Paris consists chiefly of the liquid excreta and house drain water; it is purified very successfully by sulphate of alumina, at a cost of one centime per cubic metre, the deposit is worth double the value of ordinary dung, and finds a ready market. The affluent water is used to water meadows, or runs into the Seine. The sewage is also applied without such treatment to

* "Sewage Irrigation," by Alfred Carpenter, M.D. Croydon, 1869.
† "Medical Times and Gazette," June 18, 1870.

the sandy soil of Gennevilliers, near Clichy, with the effect of converting a sandy desert into a blooming garden growing potatoes, beet, vetch, and other vegetables for Paris. The sewage is applied either to water the land as in summer (arrosage), or to form in the winter a deposit of fertilizing material, which the plants may take up when spring returns (colmatage). The result of Mr. Sandford Moore's enquiries is to show that the process of irrigation is not only practicable but useful in a high degree, and apparently has led to no injury to the public health.

Mr. Stanford* has continued his observations on the retention of organic nitrogen by charcoal. An analysis of Mr. Stanford's experiments was given in the Report of last year, and it need now be only remarked, that his plan seems to be, in many respects, very successful.

At Rheims, sewage has been treated in three ways (*a*) by sulphate of iron and lime, (*b*) by lignite and lime, (*c*) coal dust and a little sulphate of iron and lime. The two first processes yield a manure; the last a fuel. The plan with lignite is stated to be a complete success.†

In connection with the subject of irrigation with sewage a paper by Warrington on the absorptive power of soil is of interest.‡

Henneberg and Stohmann found garden soil to take up phosphates of ammonia, potassium, and sodium more readily than carbonates, sulphates, nitrates, and chlorides. The carbonates are next in order. As regards bases, soil takes up in the following order, ammonia, potassium, magnesium, calcium, sodium. Absorption of ammonia or potash from their salts is usually attended with separation of lime. A soil containing ammonia gives it off when potash salts are used. Way considered the absorptive power of salts to be especially connected with the silicates, and to be the result of a chemical combination between the salt and the silicates. In addition, the hydrated oxides of iron and alumina have been considered by Vœlcken as important agents in the absorptive power of soil. Liebig looks on the absorption as mechanical, not chemical, and the researches of the Rivers' Pollution Commissioners seem rather to incline to this.

Warrington found that hydrated oxide of iron and alumina possess great power in removing phosphoric acid from phosphate of calcium, the lime remaining as carbonate. As regards ammonia and potassium, the absorptive power of alumina was much less than that of ferric oxide, and there was "very distinct evidence that the absorption was attended with a chemical "decomposition of the salts absorbed." It was, however, rarely complete. Warrington doubts physical attraction in these cases. He agrees with E. Peters, that phosphoric acid is taken up only when the soil contains compounds of ferric oxide or alumina.

He concludes:—

1. Hydrated ferric oxide and alumina have a notable power of absorbing phosphoric acid from solutions of its salts, and the compound is a highly basic compound of the acid and the metallic oxide.

2. The hydrated double silicates contained in soil exert a considerable absorptive power which is confined to bases. Hydrated silicate of alumina and of calcium is capable of absorbing potash or ammonia from all the salts of these bases, and probably with equal energy from each. The new product is a new hydrated double silicate, in which the calcium is more or less perfectly replaced by potassium or ammonia, the calcium combining with the acid of the potassium or ammonia salts.

3. The humus in soil is capable to some extent of forming insoluble compounds with bases.

4. Some of the calcium salts (carbonate, silicate, and compounds of lime with ferric oxide and alumina) assist in various ways the operation of soil absorption.

By combining with the acids of certain salts as (carbonates, sulphates, chlorides, nitrates) they allow the bases of those salts to unite with the hydrated metallic oxides.

5. Clay, hydrated metallic oxides, and perhaps humus, possess the power of attracting to their surface certain organic and sparingly soluble compounds by virtue of simple physical adhesion.

* "Chemical News," October 14th 1870. † *Ibid*, November 1870.

‡ *Ibid*, May 1870.

To this the decolorizing power of soil is due.

The preceding notices have been chiefly occupied with the water method of sewerage. The best contributions to the history of the "dry" method are by Dr. Buchanan and Mr. Radcliffe, in Mr. Simon's Report for 1869.* There is first a Report by Buchanan on the dry-earth plan. This gives a very good summary of the plan as seen in various institutions, schools, and villages, including Wimbledon Camp (in 1869). At the end Dr. Buchanan thus summarizes his facts:—

"(1) The earth closet, intelligently managed, furnishes a means of disposing "of excrement without nuisance, and apparently without detriment to "health.

"(2) In communities the earth closet system requires to be managed by "the authority of the place, and will pay at least the expenses of its manage- "ment.

"(3) In the poorer classes of houses, where supervision of any closet "arrangements is indispensable, the adoption of the earth system offers espe- "cial advantages.

"(4) The earth system of excrement removal does not supersede the neces- "sity for an independent means of removing slops, rain water, and soil "water.

"(5) The limits of application of the earth system in the future cannot be "stated. In existing towns, favourably arranged for access to the closets, the "system might be at once applied to populations of 10,000 persons.

"(6) As compared with the water-closet, the earth system has these advan- "tages: it is cheaper in the original cost, it requires less repair, it is not "injured by frost, it is not damaged by improper substances being thrown "down it, and it very greatly reduces the quantity of water required by each "household."

Dr Buchanan also points out the agricultural value of the earth excrement its ease of transport, and its variety of application.

Another Report, made jointly by Dr. Buchanan and Mr. Radcliffe, narrates the systems in use in various northern towns for dealing with excrement. There is a good description of the "Goux System," as used at Salford and other places. In this plan a pail is used, the bottom and sides of which are lined by some dry, absorbent material, such as chaff, refuse hay, dry peat, or fern, spent dyewoods, ashes, &c. The urine is supposed to be absorbed by this, the solid excreta remaining tolerably dry. The pail is removed once or twice a week according to circumstances. The reporters did not find that the solid excreta were kept dry in all cases, and then the pail was like any unprepared pail. In other cases the excrement was drier. There is much less nuisance from these pails than from the old middens, but this appears to result chiefly from the frequent removal of the pails. In Rochdale, the Goux system, after some trial, has been superseded by a simpler plan; a little fine ash is simply spread on the bottom, and some salt added apparently with the idea of retarding decomposition. The pails are changed weekly, or oftener if necessary. There is very little nuisance from them. The sale of the manure appears to cover the cost of removal.

After describing these and other plans at some length, the reporters give the following summary of the plans they found in use among the poorer classes, who do not have common water-closets.

A. The midden system.
- (*a*) Of old type (in the old parts of almost all towns).
- (*b*) Middens of large size, and permitting much accumulation, but compulsorily supplied with some means of keeping the contents dry (covers, drains, or both), and for preventing leakage into the earth (Preston, Leeds, Birmingham).
- (*c*) The same (though smaller) with the addition of special constructions aiming at the effectual covering of excrement by ashes.
  - By sloping bottom (Nottingham, Stamford).
  - By hinged seats or steps (Manchester, Salford).
  - By ash pit and shoot (Manchester).

*Twelfth Report of the Medical Officer to the Privy Council, 1870, pp. 80 *et seq.*

(*d*) The same arrangement with the midden reduced to a mere space under the seat (Hull).

B. Pail or trough system, with cartage.
(*a*) Boxes used without preparation (Leeds).
(*b*) Boxes supplied with a little earth (Nottingham).
(*c*) Tubs with a little salt and fine ash (Rochdale).
(*d*) Tubs lined on the Goux system (Salford).
(*e*) Pails into which ashes as well as excrements are thrown and deposited daily in the streets (Edinburgh).
(*f*) Troughs or pans used with or without a little water (Glasgow, Edinburgh).

C. The earth system (Lancaster).

D. The water system with special appliances for the poorer districts.
The trough water-closet (Liverpool).
The tumbler water-closet (Leeds).

The writers then describe the best arrangements to be made in each of these methods. They insist upon frequency of removal, and this is much more easy with the pail than with the midden system. They conclude with a general summary in which they state that excrement may be removed advantageously in several methods; they prefer water-closets, if properly carried out; speak well of the earth system in some cases, and point out how the midden and the pail system may be best used. But they do not affirm that any one of these plans will develop into the perfect system of the future.

A work has been published by Professor Corfield,* of University College, which gives a good summary of the whole subject. The last Reports of the Rivers' Pollution Commissioners, and of Mr. Simon, as well as the earlier treatises, are condensed. The book will be found very useful.

Spread of the Specific Diseases.

Scarlet Fever.—Everyone is aware of the very unexpected and often unaccountable outbreaks of scarlet fever attacks in children, who have not been apparently exposed to any chance of infection from a previous case, and the occasional spontaneous origin of scarlet fever has been assumed as necessary to explain such outbreaks.

Three papers have been published, which show how scarlet fever may sometimes spread, and how difficult it must sometimes be to trace the channel of introduction. Professor Bell, of St. Andrew's, relates† an outbreak at St. Andrew's which was produced by the agency of milk carriers, possibly even by the presence of the agent in the milk itself. The facts were these. On the 1st May, 1869, a farmer's wife, who with one of her children had been exposed to the contagion of scarlet fever at a place 25 miles from her home, had sore throat, and on the following day the child got scarlet fever. A week or fortnight later another child took the disease, and subsequently a boy who carried milk to customers also had it. The case of the first child was the earliest in St. Andrew's (as I understand), and was undoubtedly derived from a previous case at a distance.

Commencing on the 9th May, and continuing till August, there were a series of 26 cases of scarlet fever in the College Hall of St. Andrew's, and in some houses in the town.

Then to connect these cases with the first cases on the farm, which derived their origin *ab externo*, are these facts:—

The Hall, and every house in St. Andrew's, except one, in which scarlet fever appeared, was supplied with milk from that farm. In other words, every house in St. Andrew's which was not supplied from the farm escaped the fever except one. The exceptional case was in a child, the source of whose illness was not traceable.

Every house to which the milk was supplied had scarlet fever, except one, in which two elderly ladies lived.

* "A Digest of Facts relating to the Treatment and Utilization of Sewage." By W. H. Corfield, M.B., Oxon (prepared for the Committee of the British Association), 1870.

† "Lancet," October 29th, 1870.

The number of the houses in which scarlet fever did and did not appear, is not given, but there can be no doubt that the coincidence was not accidental, and that the infection somehow was spread from the farm.

To explain the mode of spread, it is stated that the farmer's wife (who may or may not have had the fever) nursed her two children, and also milked the cows all the time, and it is inferred that the poison in this way actually passed into the milk. Then subsequently the milk boy carried milk all the time, he was ill with the fever, and in this way the disease may have been spread in two ways, viz., by the milk, and from the boy direct.

As further evidence, Dr. Bell narrates the following. A family living one mile from the town, and in a neighbourhood where there was no scarlet fever, got milk during the month of May from this farm. There were five children; two elder boys who had had scarlet fever before carried the milk from the farm to their home; they remained unaffected; the three other children took the disease. In this case it must have been the milk itself, and not the two unaffected boys, which was the vehicle of the poison.

The evidence of this case seems very strong, and the ease with which particles of diseased cuticle from the mother and children, and afterwards from the milk boy, would pass into the milk renders it likely that the poison was thus introduced.

A somewhat similar case has been recorded by Dr. Taylor of Penrith,* but the evidence is not quite so close. No death from scarlet fever had occurred in Penrith for three months, when a slight outbreak occurred in one portion of the town, and among the cases was a child whose father was a milkman in a small business. The milk was brought from the cows into the back kitchen, and was there filtered; it was carried out by two servants, who did not have the fever. Then at this time, within 13 days occurred, scattered through the town, six examples of scarlet fever in widely separated houses, which all derived their supply of milk from this dairy. There were a certain number of houses also supplied with the same milk the inmates of which escaped; "but in "almost every case, special circumstances afforded reasonable explanations "why their inmates should have obtained immunity." It is to be inferred that at the time the persons in these six houses were attacked, no other houses except in the part of the town originally affected had given cases, as Dr. Taylor states that the disease was not "prevailing yet among the population "generally." In this case the milk carriers were not affected, so that it is to be concluded that the milk itself was the vehicle.

The third paper is by Dr. Heslop, of Birmingham, and refers to the "diffu- "sion of scarlet fever by the laundress"† The facts here also are very striking and instructive. For years in the children's hospital at Birmingham scarlet fever was exceedingly rare. Among 500 children passing through the wards in a year, the occurrence of scarlet fever was not more frequent than in the same number of children out of the hospital. The clothes were washed outside; one laundress taking the linen from the contagious, and another from the non-contagious division of the hospital. In the beginning of 1870 the children were removed to a new building, and very soon the Medical Officers were alarmed at the frequency with which scarlet fever appeared. As the year advanced the evil increased, and from the end of July to the end of September no less than 10 cases occurred, and several cases of operation were followed by scarlet fever.

On investigation the following facts were made out. The washing which had been formerly done outside, was now done in a laundry behind the centre block of the hospital, and the drying yard is immediately behind wards 1 and 5, in which 8 of the 10 cases occurred. The other two cases were in an adjoining ward to No. 5. The linen from the contagious section of the hospital was taken to a tub in the garden in which was placed some Condy's fluid. The foul linen was from time to time taken to the laundry, where it was washed on a different day from the linen taken from the non-contagious division of the hospital. Possibly, however, the separation of the clothing of the two divisions was less complete in practice than had been intended.

* "British Medical Journal," December 10th, 1870.
† "Lancet," November 26th, 1870.

Struck by the fact of the freedom from scarlet fever in the old hospital where the clothes were washed outside, and the prevalence in the new hospital where a different practice prevailed, the Medical Officers ordered that the contagious clothes should be sent to a laundress, who took in no other washing. This was done on the 28th September, and from that time to the date of the paper (November 22nd) no other case occurred.

These are certainly pregnant facts, and give some striking lessons. Dr. Heslop considers it probable that the contagion was given off by the drying clothes and passed it is to be supposed, into the adjacent wards (Nos. 1 and 5) and he thinks it not so likely that it was communicated by the clothing of the contagious division to that of the non-contagious division. If so, then the contagiom was not destroyed by the soaking in water with Condy's fluid (the quantity of Condy is not stated), by washing in hot water and soap, by wringing, or the other processes which take place previous to hanging out to dry. It is not absolutely stated that the clothes were actually boiled, but I infer it was so, as Dr. Heslop states that the "facts show that the temperature "of boiling water is not sufficient to destroy the contagium of scarlet fever."

From this narrative Dr. Heslop concludes that we must look to the laundry for one cause of the frequency of spread of scarlet fever, especially among the rich, who now so generally put their linen out. As measures of prevention he recommends that in rich families, all articles used by scarlet fever patients should be burnt; that among poorer people, when it would be too expensive to burn the clothes, a great heat (much above that of boiling water) should be used, and the clothes kept apart from others. Fumigation with burning sulphur, then over-heating, followed by exposure before a large fire, are the measures he recommends. Under no circumstances should they be sent to a laundress. In the case of schools and hospitals the linen of scarlet fever patients should be sent to a laundress who takes in no other washing. Dr. John Ogle* also refers to the frequency with which scarlet fever is communicated by clothes; in one case a single article of infected clothing left by mistake in a drawer appeared to re-induce the disease; in another case some small woollen patterns sent by post from an infected family were believed to be the medium of transmission. Dr. Ogle also narrates some cases in which lodgings previously inhabited by scarlet fever patients were the cause of an outbreak in persons subsequently using the rooms. Such cases are indeed familiar to most of us.

Typhoid or Enteric Fever.—It is rather a singular circumstance that almost at the same time, when two cases of the spread of scarlet fever by the agency of milk were recorded, two instances of the spread of enteric fever by means of milk occurred.

The first case is recorded by Dr. Ballard†. In a certain very small district of Islington, comprising some of the best houses, with wide streets and ample space between the houses, supplied with New River water, well sewered, with a subsoil of mixed clay and sand, and some 106 to 120 feet above Ordnance datum, there occurred in 67 houses 167 cases of typhoid fever and 25 deaths. In all the rest of the parish, greatly larger, with much smaller and poorer houses and a dense population, there occurred in the same time only 13 deaths.

The most careful enquiry disclosed only 4 possible causes, and of 3 of these (viz., the influence of the widening of a railway cutting; the effluvia of the dung shoot of a large horse-yard; and local sources of miasm developed in the several houses attacked), Dr. Ballard disposes satisfactorily, and proves that they could not have been the cause of the outbreak.

The 4th possible cause was discovered in this way. A lady in whose family typhoid occurred, found that it had appeared almost at the same time in the families of four of her acquaintances. It struck her that some short time before she had changed her milkman and had persuaded these four friends to do the same. She suspected that it might be the milk, and this idea, at first received with little favour, was found on enquiry, to be backed by remarkably strong evidence.

It was found that 87 per cent. of the affected families in the affected dis-

* "Lancet," December 24th, 1870.

† "Medical Times and Gazette," November 26th, 1870.

trict were supplied with this milk, and every one of the families with fatal cases dealt with this man. Then, outside the district in the rest of the parish, 5 out of the 14 fatal cases were in families also so supplied.

To take the facts in another way. The members of 142 families (*i.e.*, both in the district referred to and outside it) were supplied with milk from this dairy, including the dairyman's own household. Of these 70 were attacked with typhoid during the 10 weeks the outbreak lasted, and these 70 houses furnished 175 cases and 30 deaths.

It was remarkable how the typhoid fever picked out as it were the houses supplied from the dairy, "Thus in one long road and a street issuing from it "at a distance of a mile or more from the dairy, it supplied 3 families; of "these 2 had typhoid. It supplied 2 families in a street with about 30 houses, "one had typhoid; in the other died an old lady from 'choleraic diarrhœa.' "It supplied four families in a new neighbourhood with about 70 houses; 3 of "these families had typhoid. It supplied 4 families in a crescent with 25 "houses; all 4 had typhoid. It supplied 4 families in a row of 9 houses; "typhoid occurred in 2 of them, and in the other 2 cases of a mild febrile "character occurred. It supplied 4 families in 2 opposite rows of houses, "altogether about 67; 7 of them had typhoid happen in them. It supplied "4 families in a square with 59 houses; all four had cases of typhoid. "And these were, as far as I can ascertain, the only cases in these several "localities."

There were few solitary cases in these 70 families. It was, however, very noticeable that where two families living in the same house used the same milk, both were attacked, but if they employed different milkmen, only one family suffered, viz., the family taking the milk from the dairy in question. There was also some relation between the amount of milk consumed and the fever; women, who take more milk than men, were more affected—97 women and only 44 males had it. In one family all the household took milk from another dairy except one young lady who fancied it from the dairy in question. She alone had typhoid. Other instances of a similar kind are noted.

The conveyance of the typhoid contagion by the milk thus seemed proved both by positive and negative evidence. How, then, did the contagion get in? After showing that it must have got in on the milk premises, Dr. Ballard gives a full account of the premises, and by arguments drawn from excluding other causes, fixed on an underground wooden water-tank as the probable cause. On opening this tank, it was found to communicate by means of rat burrows with two old drains, into one of which ran the pipe from a water-closet. It was evident that the tank was in full communication with these drains, could receive gases from them, and in cases of any temporary blockage in one of the drains must have received also an overflow of sewage. This water was used for washing the milk-cans; whether it was also used for adulterating the milk was not certain; but there was a good chance of this, not only because the addition of water is so common that hardly a dairy in London is free from the fraud, but the milk had actually been complained of because of its poorness. The water was not chemically examined until after the outbreak; it was then pure.

So far, then, the evidence is carried and, every one must admit, is extremely striking and even convincing; at least the series of coincidences is so cogent as to render the explanation of the outbreak probable in the highest degree, and the evidence from exclusion is, on its side, of the most complete kind. The case again shows in what unexpected and singular ways sewage may find its way into water and thence into other things.

Another instance of the propagation of typhoid fever by milk is recorded by Dr. Taylor, of Penrith.* In 1857 the town of Penrith had been for some time very clear of fever. Then ensued a series of cases in rapid succession in several houses in different localities. On inquiry it was found that a young woman came in September from Liverpool, ill with typhoid, to her father's cottage, a small ill-ventilated house, consisting of two rooms. Others in the house got the fever from her. The father was a milkman with three cows, and the milk was brought into the kitchen where the sick children lay, and

* "British Medical Journal," December 10, 1870.

the mother who nursed them milked the cows. During October and November cases of enteric fever appeared in 7 different households in the town which were supplied with milk from these premises, and these "formed almost the "aggregate and entirety of the cases of fever which existed in the town at "that epoch."

The absence of direct communication with the sick of the milkman's family, and in most the absence of communication even with the milk carrier, and the very transitory nature of the communication when it did occur, led Dr. Taylor to believe that the milk itself had become contaminated with the fever virus.

Cholera.—The additions to our knowledge of this subject come entirely from India. The Report of the Sanitary Commissioner (Dr. Cuningham) with the Government of India for 1869; Dr. De Renzy's Report on the Sanitary Administration of the Punjab for 1864; Dr. Townsend's Report on the Cholera Epidemic in the Central Provinces in 1868; Dr. Cornish's Report of Cholera in Southern India, the Bombay Report for 1869, Dr. Mouat's Report on the Gaols of Lower Bengal for 1879, and Dr. David Smith's first Annual Report for Bengal,—are the documents of most interest. Dr. Mouat's Report contains, in addition to Mouat's own researches, some important observations by Dr. D. D. Cunningham on the microscopical examination of Cholera discharges, while the Report of the Sanitary Commissioner with the Government of India contains Dr. Lewis's careful inquiry on the same subject. An elaborate statistical inquiry by Dr. Bryden is also contained in the Appendix to Dr. Cuningham's Report.

It seems desirable to defer the consideration of all these essays until next year, as the subject was discussed in the last Report, and as it is probable that additional important evidence will be forthcoming by that time. One or two points may be noted. Dr. De Renzy, in his Punjab Report, brings forward additional evidence in support of the spread of cholera by water-contamination, and in reference to preventive measures directed to secure the purity of water, he affirms without reserve (p. 102) that in India "practically "nothing has been done to prevent infection through water," and that at Agra, Cawnpore, Lucknow, Allahabad, and Jubbelpore, he found the water supply radically defective. He says also "through the bath, in milk, on butter, on "uncooked vegetables (which are washed in the water), or fruit, or finally in "drinking water, it (*i.e.*, the agent of cholera) has innumerable facilities for "reaching its breeding-ground in the stomach and bowels." The facts already noted of the conveyance of scarlet fever and enteric fever poison by milk give great significance to this statement.

Dr. De Renzy differs entirely from Dr. Bryden in his interpretation of the Punjab outbreaks, but to this point I hope to return next year.

Dr. De Renzy also adduces evidence (p. 117) that the application of sewage to land produces no bad effects. At Multan, during six years, the sewage of the gaol was all used in the gaol garden, 300 yards from the barracks; it was put on the ground solid, but was then immediately flooded. The practice never seemed injurious to health. In the Lahore central gaol sewage has been used in the same way without injury. He states indeed that the irrigation plan of disposing of sewage is particularly suited for the Punjab towns.

With regard to Pettenkofer's views on the influence of ground or subsoil water, Dr. De Renzy opposes the case of Peshawur, where the ground is chiefly a stiff clay, and almost impenetrable to water, and where the ground water is in some places 100 feet from the surface.

Dr. Townsend also, in the Central Provinces, records outbreaks of cholera in villages situated on hard bare trap rock, where subsoil water was "absolutely non-existent." It seems difficult to reconcile such cases with Pettenkofer's theory, but as measurements of change of level in the water are now being carefully made, the point will be soon decided.

Dr. Cuningham, in his admirable Report to the Government of India, appears less disposed to the water-poisoning view, and is evidently more inclined to Dr. Bryden's opinion of the poison being air-borne.

The work of Dr. Lewis on the Microscopical Examination of Cholera Discharges is one of great merit. It is conceived on a good plan, worked out with extreme industry, and is illustrated by numerous excellent plates. He

describes in order the cysts, spores, and micrococci found in cholera evacuations. The *cysts* were of various kinds; embryo of round worms (Ascaris mystax and Tricocephalus (dispar?); eggs of acari; and fragments of various tissues and fat surrounded by a fibro-albuminous layer. Fungoid cysts were developed by cultivation from spores, with some difficulty (3 times in more than 100 cultivations), and they were only the fructification of common fungi (Mucor aspergillus and Penicillium). The Oidium lactis (described by Thomé) was also developed. The drawings of the cysts from mucor and aspergillus correspond most closely with some of Hallier's drawings of "cholera fungi." The conclusion is to show that there is nothing peculiar in any of the "cysts."

The *spores*, so-called, appeared to be of various kinds, viz.:—1. Globules of a fatty nature. 2. Altered blood cells. 3. Corpuscles embedded in the tenacious substance composing the flakes of cholera stools. 4. Globular conditions of certain infusoria. Illustrations are given of all of these. The red blood-cells, though it may be in great numbers, often do not yield a trace of colour to the discharges. Amœba-like motions were sometimes noted in them. The corpuscles in the flakes are of two kinds; some of them move, change their form, and sometimes have anterior filaments; they are not spores, and cannot be made to germinate.

One kind are (Dr. Lewis thinks) pathological, *i.e.*, derived from the body and consisting of blood plasma, not of epithelium; but another kind are animalculæ, and belong apparently to the Englenæa family, so common in tanks; they are not peculiar to cholera—at least, Lewis has found them in an ordinary evacuation from a healthy man; they exist both in the "still" and active conditions.

The "micrococci" are far more difficult to investigate, and Lewis does not consider that he has exhausted this part of the subject. Hallier looks on the micrococci as the disintegrated spores of a special fungus, which may eventually, under favourable conditions, grow.

In *fresh* cholera discharges these micrococci and bacteria and vibriones do not exist in great numbers, but they grow afterwards. At present Lewis has not been able to develop any bodies from the micrococci of cholera stools which are peculiar or different from those developed under other conditions. Whether these so-called "micrococci" are or are not peculiar in their nature Lewis does not decide, but leaves the question for future consideration.

These observations and those of Dr. D. D. Cunningham, to which I have now to refer, appear to me to be the most satisfactory which have ever been made in this direction. Owing to the permission of Dr. Mouat, Dr. Cunningham was able to examine all the discharges of persons who died from cholera in the gaol at Alipore, near Calcutta. No less than 141 observations are recorded. In all the stools Cunningham found oval and circular cells in the flakes of the stools. These are amœboid bodies, capable of changing their form, and having often delicate filaments projecting at one end. Cunningham's plates in several cases are quite identical with those of Lewis, except that he does not figure an anterior filament. These bodies live for any length of time in finely-powdered earth. Dr. Mouat states that they cannot be distinguished from similar infusoria which abound at certain times in the water and soil of Calcutta.

Intermittent Fever.—Long Period of Incubation.—Dr. Fiedler* describes some cases in which there was an extraordinary long period of incubation. Dresden is usually free from malarious disease, but several persons suffered in 1869. So also in Leipzig. The "ground-water" was not altered. (p. 428).

In Leipzig—

1	case had the	1st	attack	9	months	after exposure to cause.
1	"	"		6	"	" "
1	"	"		10	"	" "
1	"	"		8–9	"	" "

In Dresden (p. 431)—

1	case had the	1st	attack	1	month	after exposure.
1	"	"		6	"	"
1	"	"		10	"	"

* Archiv der Heilkunde." Band ii, p. 245. 1870.

Another case is recorded in the same journal (p. 492). Dr. Rheinstaedler went to Nordemey in August 1861; he returned to Cöln (where there is no chance of getting intermittent), and in May 1869 was attacked with "a "colossal severe attack of intermittent."

Typhus, Typhoid, and Relapsing Fevers in India.—Dr. Fairweather, in Dr. De Renzy's Report on the Punjab for 1869 (Appendix VIII.), gives accurate clinical histories of several cases of severe fever in the Rawul Pindi gaol, which in most cases, he identified as true exanthematic typhus. There was sudden access of symptoms, great prostration, headache, coated and then dry tongue, quick pulse, flushed face, injected eyes—quick pulse—delirium coming on early; eruption of pinky spots, becoming darker, not disappearing on pressure, appearing all at once from the 4th to the 8th day, and lasting to the end. Duration of disease 12 to 21 days; in a large proportion of uncomplicated cases convalescence commenced on the 14th day. On *post-mortem* examination no ulceration of Peyer's patches. This seems to have been undoubted typhus, and the existence of this fever in Upper India is now for the first time undoubtedly established.

At the same time enteric fever prevailed in the gaol, and perfect histories and *post-mortem* examinations are given. In the first 6 months, out of 1,105 mean strength, there were 563 attacks (50 per cent.) and 84 deaths (equal to 14·92 per cent. of cases treated).

A wide-spread and fatal fever prevailed in many parts of the Punjab in 1869, which was not very clearly identified. Many called it malarious, and attributed it to the late and heavy rains; but Dr. De Renzy doubts both assertions, although he is not satisfied that he can yet solve the problem; but a fatal fever, killing in some districts 1 in 3 attacked, he thinks can hardly be malarious. He questions whether typhus, typhoid, and relapsing fever may not all have been present. Dr. De Renzy considers that the diagnosis cannot be made without further accurate clinical investigations.

The intimate Nature of Contagia.

The various speculations on the nature of the active agencies of the contagious diseases are at last being brought to the test of severe experimental enquiry. The observations of Chauveau on the vaccine lymph, small-pox, variola ovina, and farcy, have been extended and rendered more precise by Sanderson, who, in a paper in Mr. Simon's Report* has continued the discussion of this subject. Verifying every statement by experiment, Sanderson shows conclusively that the agents or contagia of these diseases are solid particles and not vapours; that they are of the same specific gravity as the liquid, and therefore extremely light, of the same colour and transparency, and of the same power as regards refraction of light. They are also indiffusible in fluids or gases. These statements are based on the discovery of granules in the fluids which are inoculable, and on the fact that by careful dilution the number of successful inoculations, *but not the intensity of the resulting disease*, can be clearly shown to depend on the amount of dilution, *i.e.*, on the greater or less chance there is of inserting a contagious granule. So far the experimental proof seems as strong as possible. As to the nature of these granules, Sanderson, in a very cautious manner, considers them as of albuminous material, and as belonging to the order of organic beings capable of increase by self-development when they find fit nutriment. This leads him to a full discussion of the Beale theory of germinal matter, and of the existence and value of the minute bodies known as micrococci by Hallier, as microzymes by Béchamp, and which are included by De Bary under the class of schizomycetes. In this direction he is obliged to discuss Hallier's opinions and researches, and without at all giving Hallier the weight of his authority, he does more justice to that indefatigable worker than has always been the case. The paper is only an introduction, but it is an admirable exposition of the subject, and should be read by every one. Next year I hope to be able to take up the subject in greater detail.†

* Twelfth Report of the Medical Officer to the Privy Council, 1870, p. 229.

† Since this section was written, two works by Dr. Beale (on Disease Germs, their supposed and real nature) have been published. An abstract shall be given next year.

The Parasitic Origin of Disease.

Since John Harley discovered, some years ago, that the endemic hæmaturia of the Cape (and probably of the Mauritius) is dependent on the eggs of the Bilharzia, great interest has attached to the question of the mode of introduction of the parasite and of its geographical distribution. In a paper read before the Medico-Chirurgical Society,* Harley narrates a case of a gentleman from South-Eastern Africa who suffered from the prostatic variety. He seems to have little doubt of the introduction of the disease by water, as he has succeeded in liberating as many as 20 embryos from the egg in water. The embryo is a little ciliated animalculæ, strongly resembling many of those found in the stagnant water of this country.

Harley also alludes to the fact that the colonists at the Cape, especially at Port Elizabeth (not far from Algoa Bay), suffer from boils, which he thinks proceed from ova introduced during bathing, and from these boils possibly embryos enter the body. This gives some support to the view that the Delhi and other boils may be connected with some parasite, as referred to by Drs. Smith, Fleming, and Aitken, in last year's Report.†

In connection with this it may be noticed that Lewis, in his Cholera Report,‡ mentions that in examining the urine of a patient with chylous urine, he discovered the embryos of a round worm embedded in the gelatinized substance from the urine. He figures the embryo without deciding its name. The chylous condition of the urine disappeared, and with it all trace of entozoa. The size was very small, as Lewis calculated that 200 of the larger size could pass together through an orifice not exceeding the 50th of an inch in diameter.

* "Lancet," December 1870.

† "Army Medical Report." Vol. X., p. 39, *et seq.*

‡ Bengal Sanitary Report for 1869. Calcutta. 1870.

I learn from private information that Lewis has now discovered these embryos in several other cases of chylous urine.

APPENDIX No. II.

NOTES ON HOSPITAL AND BARRACK CONSTRUCTION AND VENTILATION.

By Deputy Inspector-General Massy, M.D., C.B., Head of Sanitary Branch.

Although the discussion on hospitals and hospitalism, upon which so many competent authorities have entered, has more directly concerned the civil element of the Medical profession, it has, I am aware, long engaged the attention of many Army Medical Officers, and must be a matter of interest to all of them.

Army Medical Officers occupied in so many parts of the world, are by the very nature of their duties connected more than any other class of men with questions concerning the preservation of health, and the construction of buildings best suited to attain it under various conditions of climate. Soldiers are usually grouped together in large numbers. The best arrangement of buildings for the habitation of numbers in aggregation, in form, space, means of ventilation, warming and lighting, is constantly presented to the observation and consideration of Army Medical Officers. Moreover, their attention is now-a-days specially directed to these matters in the early portion of their career, by the instruction afforded them by the Professor of Hygiene when passing through the school at Netley, which lays the foundation for their subsequently becoming practical and scientific investigators. The Sanitary Reports, which my position affords me the advantage of perusing, show that in the majority of instances these opportunities have not been neglected.

It may be urged that, as barracks and hospitals are built upon certain established plans, the views of Army Medical Officers are not consulted on the subject. These plans, however, have resulted from the reports of Medical Officers, who have persistently shown, from time to time, the effect of defective sanitary arrangements upon the health of those under their charge, both at home and in our various dependencies abroad, and these Reports have not less persistently included the remedies which have from time to time guided those who have had the power to apply them.

Our barracks and hospitals are of the most varied description. Some of the former, even at home, are very objectionable—bad in construction: and others are bad in construction, position, and local surroundings. Among the latter, I may instance the Old Clarence Barracks at Portsmouth. Others, again, are very defective dwellings, from the fact that they had to be conformed to the necessities of fortification, to wit, many of our casemates, and notably the long casemates at Dover Castle, which are only saved from becoming foci of disease, or the cause of impairment of the general health of the occupants, by the care that is taken to keep them clean, to avoid overcrowding, and from the frequent movements of our troops.

We also have many good hospitals and barracks, and their number is gradually increasing. Their diversity, as regards structure and arrangement, affords full opportunity for comparison.

It would be easy to quote largely from the Reports of Medical Officers of days gone by to prove the necessity—judging from the representations which were urgently made—to procure better buildings, more space, and other radical

sanitary improvements for the troops under their charge; but such details would serve no good purpose, for those defective conditions, such as now seem almost incredible, have for many years ceased to exist. The following brief statement of the conditions that once prevailed in a portion of the West Indian Command, may however serve to indicate the difficulties that Medical Officers had to contend with, and how successful has been the result of their recommendations.

Not only were troops in tropical climates badly housed, fed, and clothed, but they were sent to stations altogether unsuited to European soldiers.

The history of the men serving on the West Coast of Africa during 1824–25, and –26, presents results that are, I believe, unparalleled. At the Gambia, from May 1825 to December 1826, a period of only 19 months, 279 perished out of a force, of which the number on shore seldom exceeded 120, and was sometimes as low as 40.

I find that in the West Indies, in the Windward and Leeward Command, during the period from 1817 to 1836 inclusive, the annual mortality of white troops is shown in the Official Reports to have averaged a rate of 81·5 per 1,000.

Still quoting from the Reports, I find Dr. Bone, Inspector-General of Hospitals says, that even in 1842 and 1843, there was only six inches between the mens' cots. After four epidemics of yellow fever, and much suffering besides from dysentery, pectoral disease, and ophthalmia, he succeeded in 1845 in obtaining an increased allotment per man. Inspector-General Bone further observes in his Report for 1842, "The plan of the Royal Ordinance for accommodating 50 patients in the hospital at St. Vincent is a curiosity, and should be published. Two bedsteads were placed touching each other, and six inches of space was allowed between each pair of bedsteads. Two patients in each bed is prohibited in the British and French hospitals, but in this hospital the Royal Ordinance would put 50 patients in one bed, for the intervening six inches between pairs of bedsteads would not make perceptible breaks in the continuity of beds." If, in addition, it is understood that the soldiers were provided with salt meat rations five days a week, there will be little difficulty in comprehending how this terrible mortality occurred in such a climate. It is however to be recollected, that in those days sanitary science was, as a general branch of knowledge, at a very low ebb. Except Medical Officers, few believed in the conditions stated being fertile causes of disease; and to the climate alone attached the opprobium of these sad results. Those who can recollect the conditions that prevailed even 25 years back, must be familiar with the crowding in barrack-rooms at home, and the horrible state of the atmosphere which it is now fully recognized swelled so greatly the list of mortality and invaliding amongst our troops.

Let us contrast the conditions of the present day with the foregoing. We have not any white troops on the West Coast of Africa. We recognize the necessity of affording 1,000 cubic feet, and from 75 to 80 square feet per man in barracks in the plains in the West Indies, and 1,500 cubic feet in hospitals. By the Return for August last, it appears that the men in barracks at Barbadoes had from 946 to 1,198 cubic feet each, and over 2,050 in hospital. In Jamaica our white troops are located at Newcastle at an altitude of 3,800 feet, and salt rations are only supplied once a week in any part of the West Indies. The result is, that in the Windward and Leeward Command during 1868, the mortality amongst our white troops was only 9·92 per 1,000, and in 1869 only 5·65.

I hope to be able to show in the course of the following remarks, that the principle now adopted in the construction of our more recent regimental and general hospitals is the best calculated, *cæteris paribus*, to ensure good air in buildings of their size.

The late Sir James Simpson, after much labour, and with great clearness, put forth his views on hospitals. He gave, I think, a very good general idea of those views in the remarks he made at the Meeting of the British Medical Association at Leeds in 1869. His principle is to disperse the sick. He argued that it was safer to treat one man by himself than two together, and two rather than three, and so on; that as you increase the aggregation, the conditions become more unfavourable; that every patient adds his share of pollu-

tion to the atmosphere, and that such aggregation associated in a large building under one roof is very unfavourable to recovery.

Sir James Simpson distinctly declared that he was not opposed to hospitals, but only to hospitals as at present constructed. He argued that where hospitals are necessary the smaller they are the better, and when it is necessary to construct them for a large number of sick, that they should consist of a number of small detached buildings, each having its own distinct and separate ventilation.

Abstractedly considered, the advantages of dispersion and segregation would, I presume, be almost universally admitted, but these involve many conflicting elements as to general, much less universal practicability, as regards large or even medium-sized hospitals; and the necessity on the grounds of health should be so clearly shown as to counterbalance the objections on the ground of extent of site, expense of administration, and other items of cost and inconvenience. Although the plan of comparative segregation thus advocated by Sir James Simpson may not be necessary or capable of application to the extent which he would propose, I believe it to be based upon sound sanitary principles. By such a system the sick would be extensively spread out. On the mere question of size, a small ward is more easily ventilated than a large one, and the fewer the occupants the fewer the sources of impurity. Diseases liable to contaminate or spread are less likely to occur in a small ward, and to injure fewer persons. Complete isolation is more readily accomplished; and a number of small detached wards admit of some being periodically emptied for a time, (rested as it were), throughly cleansed and ventilated,—a most important feature in hospital management.

It is necessary however to draw a clear distinction between segregation of individuals placed under favourable circumstances, and mere segregation of dwelling places, even of the smallest dimensions; for it must be borne in mind that a few men in a small ill-ventilated apartment, however isolated, would be just as liable to suffer from the effects of atmospheric impurity, as a large number would in a larger one under similar circumstances. Dr. Muir, Inspector-General of Hospitals, in his Report to the Army Medical Department, dated April 1866, on the sanitary arrangements in the United States Army, mentions that, in the early portion of the American Civil War, the tents were over-crowded, and the result was such an amount of sickness as to lead, as the war advanced, to the almost total abandonment of one kind after another. After the battle of Sedan it was found that small hospitals established in private houses were quite as unhealthy as large ones. Dr. Frank, who had charge of several of these small hospitals, mainly attributed their unhealthiness to overcrowding and bad hygienic conditions.

The assembling of considerable numbers of human beings under one roof —having as it were a common habitation—is surely an artificial existence, departing as it does, in a great degree, from what we associate with the healthiest conditions of life. I conclude that sparsely distributed houses in a healthy rural district would nearly embody the typical state in which we would wish to place men to preserve health.

Mankind tend to associate in towns and cities; in fact nations could never attain importance or advance in civilization without such aggregation; but even this state palpably differs from the constant occupation of large buildings, such as barracks and hospitals, consisting of different stories of large rooms, having usually a common atmosphere, and generally imperfect ventilation.

The advantages of dispersion and subdivision into small bodies, in the case of larger groups dwelling in houses becoming the subjects of epidemic disease, is seen in the West Indies, and in India, where the best results have often followed the removal of soldiers from barracks into tents, and these have ensued where the short distance to which they have moved precluded the idea that the benefit was due to a change of climate. Two or three men in a tent, which so readily admits of the freest ventilation, is believed to provide them an atmosphere as pure as obtainable, and subjected to the fewest sources of human pollution. I could advance many instances in corroboration of this both in the East and West Indies.

It is not often that an opportunity occurs of showing the converse, that

is, where exemption from sickness has been forfeited by a too great aggregation. Dr. Bryden states that in the cholera epidemic of 1853, a battery of Artillery at Cawnpore escaped altogether, until it was necessary to take up more room in barracks for the 70th Regiment, at the time suffering from Cholera. The Artillery were thus "doubled up" into half the space previously occupied. Cholera immediately broke out, and twelve men died out of a strength of sixty.

It has been frequently remarked, that the prevalence and mortality from cholera amongst British soldiers in India are vastly greater than amongst Sepoys. This has been attributed, and with much apparent reason, to the fact that the former are aggregated in large barrack-rooms, whereas the latter are located in small separate native huts. And that the comparative exemption of the Sepoy is not due to race or climatic conditions is inferred from the fact that the Sepoy is as liable, nay even more liable, to malarious disease than the European, from which his dwelling place affords him no exemption, and from which it might reasonably be supposed that climate and race would somewhat shield him.

It has been shown, moreover, that when Native soldiers are congregated together, as on board country boats going up or down the Ganges, they are equally liable to cholera as European soldiers. And strictly in accordance with this, is the fact of the comparative immunity of European officers in India from cholera, a fact that is explicable upon no such reasonable grounds as their living so generally in detached houses.

It is but right to observe that Dr. Cuningham, Sanitary Commissioner with the Government of India, in his Report for 1869, states that Sepoys in that year did not altogether enjoy this exemption from cholera; and that, in some instances, those living in huts, at stations where European troops were also located, suffered as much, and in a few instances even more than the latter. This evidence however is only for one year, and notably an unhealthy one. It would be necessary to be made aware of the sanitary relations of these huts before admitting a conclusion opposed to what has been considered almost a general law, and the more so as Dr. Cuningham has given a Table of eight stations where cholera extensively prevailed, and the average of the admissions at these stations was of Europeans 86·37 as compared with 11·75 of Native troops.

It might be assumed that if the subdivision and dispersion of large bodies of healthy men have proved salutary under circumstances of actual or threatening epidemic invasion, still more might we expect favourable results to follow in the case of sick or wounded from the adoption of a similar procedure. I may however instance the following. During the Sutlej Campaign in 1845 and 1846, the wounded of the British Army were assembled in the hospitals at the frontier station of Ferozepore. The necessity of adequate superficial space was probably not as fully recognized then as now. Hospital gangrene and other morbid states indicative of faulty hygienic arrangements were extensively manifested amongst the wounded. Early in 1846, the 31st Regiment was ordered home to England on the termination of the war, and passing *en route* close to Ferozepore, all the men of the Regiment in hospital capable of moving were directed to accompany it. These included over 150 wounded, several of them suffering from hospital gangrene and unhealthy conditions of wounds. The Regiment moved daily with only occasional halts, marching in a short period several hundred miles. The wounded were carried in dhooleys and lodged in tents. After a few days the character of the wounds improved; and in a short time hospital gangrene altogether disappeared.

In 1858, during the Indian Mutiny, a number of wounded Native Cavalry soldiers were located in a house at Seetapore in Oude. They were overcrowded, and the house was indifferently ventilated; the result was gangrene and unhealthy wounds. The hospital was broken up, and the men despatched in country carts and dhooleys to their homes in a distant part of the country. After a few days they improved, and eventually, while on the march, all gangrene and evidences of unhealthiness disappeared.

The experience of Army Medical Officers from remote periods has been opposed to the aggregation of sick and wounded. At the risk of being considered prolix, I make the following quotation from Sir John Pringle's

"Observations on the Diseases of the Army," written during the first part of the last century. At page 128 he says, "if the general hospital be obliged to "admit a great number at a time, it will be proper to have the sick dispersed "in two or three villages rather than kept in one, though a narrow compass "might be more for the economy of the hospital, as well as more convenient, "and for the easier attendance of the sick. The greatest danger is foul air, "which can never be compensated for by diet or medicine."

Though we have numerous hospitals of different characters and sizes in the Army, we have no means of instituting anything like a crucial comparison of their respective advantages. On home service, the frequent change of regiments and differences as to their composition and antecedents are all antagonistic to such enquiry. Moreover, even if these objections did not exist, it would be impossible to derive much information from any comparison, inasmuch as the ordinary cases of sickness would not be suitable; and surgical operations of that class which have been so prominently used in the discussions as the groundwork of comparison, are not sufficiently numerous in the Army during peace to render the comparison applicable. During a period of war our hospitals have usually been extemporized from any available accommodation. During the Crimean War we had evidence of a terrible mortality in the large general hospital at Scutari, and of a much less amount at our smaller hospitals in the Crimea. Still, even these latter were very imperfect for the purpose of comparison, as they were of necessity much too crowded. Army Surgeons largely used tents for their worst cases, and with the best results; and their experience is uniformly in favour of treating sick either singly or as little associated with others as possible. I can however advert to one or two instances in which the success of small military hospitals has been very evident, though unfortunately an accurate detail of the cases treated is wanting. The Castle Hospital at Balaclava in the Crimea consisted of a number of wooden huts, affording accommodation for from 12 to 14 men in each, and of huts of a somewhat larger class, affording room for about 20 beds in each. The occupation was frequently less. They were all ventilated at the ridge, and by opposite windows, and by doors at the ends, with ventilation over them. They gave a wall space of about four feet to each patient when full. From the 3rd March, 1855, to 30th June, 1856, admissions and deaths stand thus:—

	Admissions.	Deaths.
Wounds and Injuries ..	1,834	83
Other Causes	720	13
Total	2,554	96

This gives a death rate of only 3·7 per 100. As this establishment was almost on the scene of operations it doubtless contained cases of wounds of the greatest gravity. If we compare these results with those obtained in the large hospitals erected during the civil war in America, it will be seen that the experience of the small huts at the Castle Hospital at Balaclava was even more favourable than that of the Americans, though they may well be proud of their great success and of the wonderful energy displayed in the provision of such vast establishments. The following description accords with the orders which ruled the construction of the American hospitals, though differences frequently occurred.

Detached, wooden, single-storied pavilions, each forming a ward 187 feet long by 24 wide, accommodating 60 patients. This is the unit, increased by multiplication in many instances to a great extent, as in the Philadelphia Hospital, which contained 3,000 beds. The arrangement of the pavilions afforded much diversity in different localities. The average mortality of sick and wounded in those situated near the base of operations is stated to have been 8 per 100; but none of them, through which any considerable

number of wounded passed, give so small a mortality as the Castle Hospital at Balaclava.

The last New Zealand War has afforded a good example of small well-ventilated huts for the treatment of wounded, as well as the evils which have been often observed to arise from the location of wounded in houses not adapted for the purpose.

Inspector-General Mouat, V.C., C.B ..in his Report on Wounds and Injuries received during his New Zealand Campaign of 1863–4 and 65, makes the following observations :—" The wounded, after their transfer from the field of " action were treated in the general hospitals. The huts in which they were " placed were most thoroughly ventilated, not entirely by any designed system, " but by the warping of the boards, permitting the perflation of air in all " directions. The number of wounded placed in a hut was kept low, so that " each man had 670 cubic feet of air allowed him, and when placed in marquees " 598 cubic feet. These proportions may seem very small when compared " with the allowance made in civil hospitals, but it must be remembered that " to erect hospitals of any kind in an enemy's country, and with the small " available resources of an army engaged in harassing warfare, was a point of " much difficulty. The men treated in the general field hospital huts in the " Crimea had only 260 cubic feet of air each; in our field hospital at Queen's " Redoubt we allowed to each wounded man in huts 670 cubic feet. From " first to last," says Mr. Mouat, " none of the complications so common in " military hospitals in the field were seen. No case of pyæmia, erysipelas, " hospital gangrene, tetanus, or secondary hæmorrhage occurred. The most " formidable wounds healed readily, and some injuries, reckoned elsewhere the " despair of surgery, did well there. During the war there was one place at which, " for a short time, wounds did not do so well—at Tauranga. There the wounds " were inclined to take an unhealthy action : the flaps of stumps sloughed, " secondary hæmorrhage appeared, and the men generally did badly. The " cause was evident, and as it admitted of prompt remedy, Tauranga became " as healthy as any other hospital. The wounded had been placed in a very " comfortable house, where plastered walls and ceilings effectually prevented " the irregular ventilation which was so beneficial in its effects at Queen's " Redoubt Hospital. The house acquired the sickly hospital smell, which was " ineradicable ; disinfection did no good, and yet the entire cubic space " allowed to each patient was not less than 800 feet. The patients were, most " of them, removed from this house, placed in marquees, and at once every- " thing changed ; the most unpromising wounds did well, and no more satis- " factory cures could have been achieved elsewhere."

Similar evidence, in regard to the use of tents for the occupation of wounded men, was obtained during the Italian War of 1859, for the details of which the reader may refer to Professor Parkes's " Report on Hygiene," Army Medical Department Report for 1862, pp. 345 to 348.

The statistics of major limb operations which Sir James Simpson used as the facts to support his views, produced such conflicting counter-statements, and so many disturbing causes have been advanced to invalidate them, that it appears to me to quote them would necessarily include their defence, and this would require a knowledge of their accuracy such as I do not possess. It appears very probable that the respective merits of large and small hospitals will ultimately receive much light from the records, when reliably kept, of lying-in institutions. The well-known extreme susceptibility of parturient women to zymotic disease seems to point to them as a most suitable test of atmospheric impurity. The proclivity of lying-in women to puerperal fever is so great that not only will medical men and nurses convey this disease from one patient to another, but many hold that other diseases of the zymotic class are similarly liable to produce puerperal fever. The degeneration of tissue and condition of the system resulting from parturition render the patient liable to the effects of any hospital impurity.

There is a small hut hospital at Colchester Camp exclusively used for lying-in women. It is an ordinary wooden hut; has a nurse's room at either end; and the centre is divided into four small wards, for one patient each, 10 feet by 9 feet 10 inches, by 10 feet. Ablution is performed in the wards ; there is no water-closet in the hut, and the excreta are at once removed by hand. From

1865 to 31st October, 1870, 252 women have been confined in this hospital without a single death.*

I will instance one other small hospital only used for parturition, the Waterford Lying-in Hospital, the statistics embracing a period from March 1838 to October 1867. From 1838 to 1844 a small house was rented for hospital purposes; two rooms were available, one used for the delivery of the patients, and the other contained 8 beds into which the patients were removed after delivery. From October 1844 to October 1867, the hospital consisted of another small house; but instead of the 8 beds being grouped together in one ward they were divided between two, 4 beds in each. The mortality from puerperal fever was, in the first hospital, 1 in 251 during 6 years and 6 months, while the mortality from the same cause in the last-named hospital was only 1 in 1,328 during a period of 23 years. There was a period of 6 years in which 566 women were delivered without a death from any cause, and another of 4 years, similarly favoured, during which 558 women were delivered.† It ought to be noted that in point of position the first hospital was the best. Waterford contains about 28,000 inhabitants, and it enjoys no special exemption from zymotic disease; indeed, puerperal fever has prevailed through the town during years in which the hospital was nearly or altogether free from it.

The relative terms, *small* and *large* hospitals, do not appear to be very definitely understood. Is a small hospital to be considered one or two small buildings,—a mere village hospital; or should the term be applied to a number of small separate buildings, each holding a limited number of patients? I believe this aggregation of small units is accepted as embodying the principle of a small hospital in contrast with a large establishment under one roof. In this sense, the hut hospitals at some of our camps, as at Aldershot, consisting of many separate wooden huts, each containing from 10 to 12 sick, are small hospitals, irrespective of the extent of the multiplication of huts; and I conclude that it is something of this class of structural arrangement, the materials being different however, that Sir James Simpson would have recommended for hospital construction, modifying, according to circumstances, the size of the huts and cubic space to occupants, and employing as few or as many huts as the necessities of localities required. Extensive establishments on this plan would require a large site, and would not be as comfortable as the present class of permanent buildings, and the nursing and administration would be expensive;‡ yet, if the huts were well built, carefully warmed and lighted, and of sufficient number to leave one or two, as the case might be, constantly empty, for alternation of occupation, after cleansing and rest, with the others, they would no doubt be found to contrast favourably with large structures. Were England involved in war, it is highly probable that should hospital accommodation be required for sick and wounded in excess of the established military institutions of the country, the want would be met by this class of structures, either extemporized from portions of our existing camps, or by new constructions of a similar character.

The structures usually adopted in the Army as small hospitals are tents and wooden huts.

The Regulation Hospital Marquee is a double canvas tent, with an ample space between the inner and outer roof. Its inside dimensions are 29 by 14 feet; the side walls, 5 feet 4 inches; the height to ridge, 11 feet 8 inches; and it has a cubic capacity of a little over 3,000 feet. This is a well-ventilated tent, and in warm weather additional ventilation to any extent can be procured by raising the side walls. The Government cost of this marquee is 28*l.* 1*s.* 6*d.*

* The tradition is, that for many years prior to the date of this official statement, before records were kept, there was not a death, though exclusive of the above, more than 300 women had been confined. I took some trouble to ascertain the truth of this tradition on the spot, but as the results do not stand recorded in the hospital books, the numbers in the official record are alone used.

† "Dublin Quarterly Journal," November 1867:—The total mortality was the following:—In the first-named hospital, from March 1838 to October 1844, out of 753, 6 died, or 1 in 125½,—being a percentage of 0·79, or 4-5ths nearly. In the second, out of 2,656 women, 9 died, or a total mortality of 1 in 295½, or a percentage of deaths of 0·33.

‡ *Vide* "Notes on Hospitals, by Miss Nightingale, 1863."

The ordinary dimensions of our wooden huts are 38 feet by 20 feet, with a height of 8 feet to eaves and 12 feet 6 inches to ridge. They are lined with wood, and raised on a brick foundation from 12 inches to 18 inches, and ventilated by means of opposite windows and doors, and by openings at the ridge and at the ends. They are intended to hold 12 men each, with a cubic space of 600 feet per bed. They are heated by small open stoves, with a chimney through the roof. The cost of these structures has varied at different stations; thus those at Colchester were erected at 105*l.* each; at other stations they cost more, but the expenditure may be probably estimated at from 130*l.* to 140*l.*

Brick and iron huts are used in our camps as barracks.

Iron huts are very similar to the foregoing; they are lined with wood, and the cost is about 140*l.*

Brick huts are of the following dimensions:—

	Ft.	In.		Ft.	In.	
Interior....	38	8	by	20	0	
Height to eaves	....		....	10	6	Exterior above footings.
„ „ ridge	....		....	15	6	
Where ceiled	....		....	11	6	From floor line to rafters and collars.

They are constructed of two 4½-inch brick walls, with space of 2 inches between them, united by iron ties at every fourth course in height and 2 feet 6 inches apart. The cost is from 160*l.* to 170*l.*

They are provided with outlet and inlet shafts, Sheringham valves, and Galton's grates.

During service in the field, if a sufficient number of hospital marquees and wooden huts could be made available for the treatment of wounded, instead of extemporizing ordinary buildings, I believe the results would be attended with marked success; but unless at bases of operations, it would be very difficult, if not impracticable to make such a provision.

The accompanying Plans are not introduced in consequence of their possessing any novel features, but two of them (II. and III.) are the latest hospital constructions of the War Department, and their cost and dimensions may be of some interest.

Some of the hospitals lately erected in London, and utilised for the reception of infectious diseases have, I believe, very considerable merits; and I am informed that an excellent and cheap workhouse hospital has been recently erected at Chorlton, near Manchester.

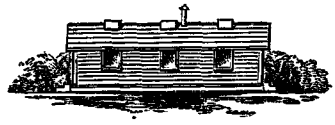
I. Small wooden hospital, or barrack hut, as used at our various encampments, except at Aldershot and the Curragh.

II. Plan of small brick hospital at Western Heights, Dover. The cost of this was 698*l.*, or something over 34*l.* per bed; but this sum only includes the hospital building, the administrative portions and other offices belonging to the General Hospital being used in common for the two establishments.

III. General plan of the new Lock Hospital, Chatham, containing 80 beds, and erected at the cost of about 100*l.* per bed, including water supply, drainage, lighting, &c.

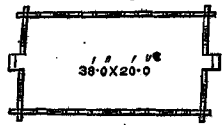
IV. Plan of a moderate-sized hospital of an inexpensive character, to which some additional wards could be obtained by the erection of an additional storey to the centre, as in our regimental Cavalry hospitals.

I.



ELEVATION.

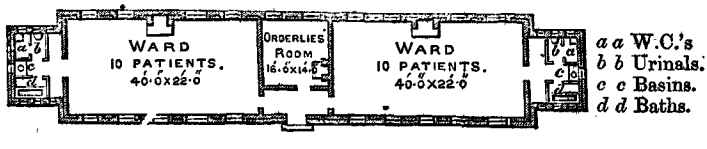
HOSPITAL HUT, COLCHESTER.

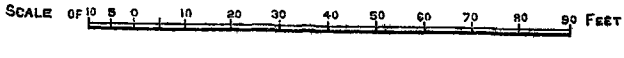


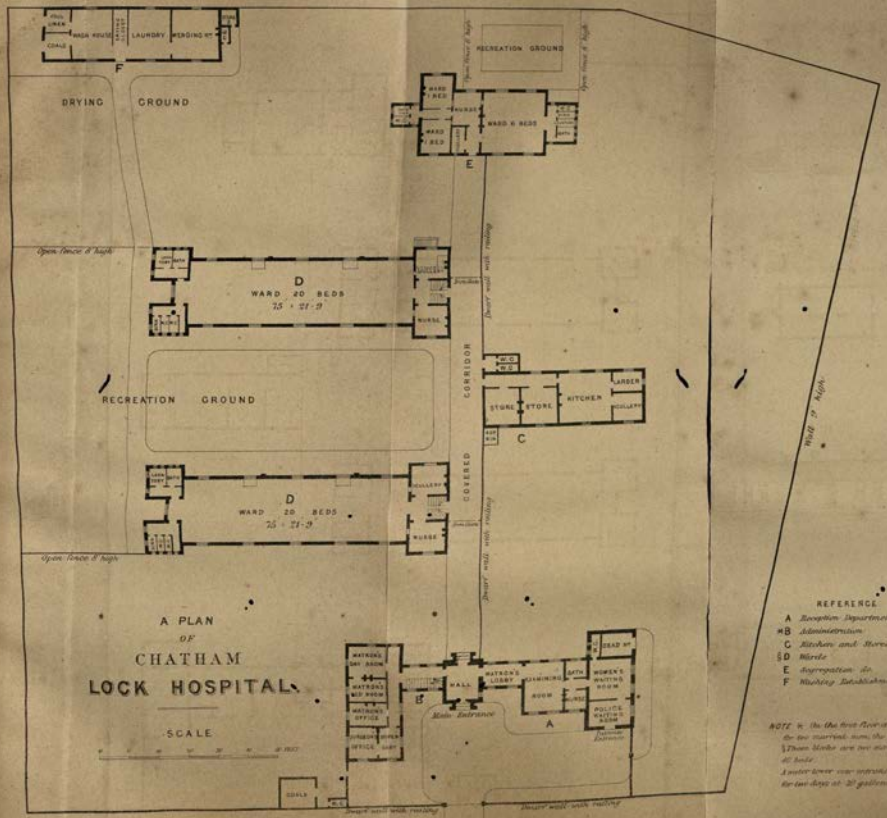
II.

ELEVATION.

HOSPITAL HUT, DOVER.







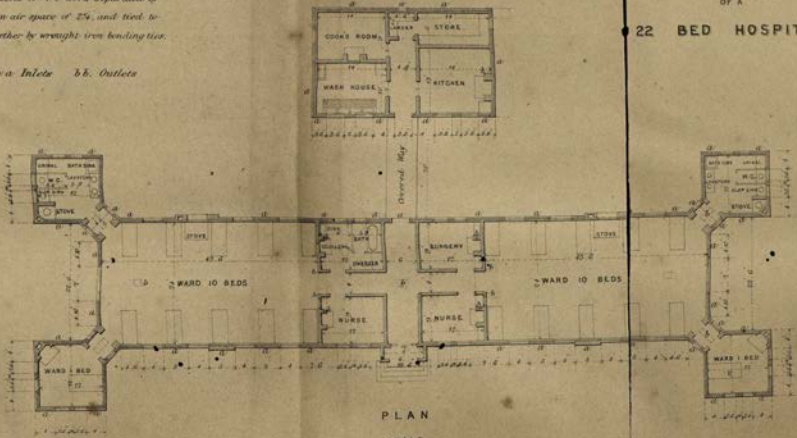
WASH HOUSE
LAUNDRY
MERGING WT
COALS
F
DRYING GROUND
RECREATION GROUND
WARD 1 BED
NURSE
WARD 6 BEDS
E
Open fence 8' high
D
WARD 20 BEDS
75 × 21·9
NURSE
Dwarf wall with railing
CORRIDOR
COVERED
RECREATION GROUND
STORE
STORE
KITCHEN
LARDER
SCULLERY
C
D
WARD 20 BEDS
75 × 21·9
SCULLERY
NURSE
Open fence 8' high
Wall 9' high
A PLAN
OF
CHATHAM
LOCK HOSPITAL.
SCALE
MATRON'S DAY ROOM
MATRON'S BED ROOM
MATRON'S OFFICE
OFFICE
OFFICE
B
HALL
Main Entrance
MATRON'S LOBBY
EXAMINING ROOM
BATH
NURSE
DEAD WT
WOMEN'S WAITING ROOM
POLICE WAITING ROOM
A
COALS
Dwarf wall with railing
Dwarf wall with railing
REFERENCE
A Reception Department
B Administration
C Kitchen and Stores
D Wards
E Segregation do.
F Washing Establishment
NOTE. In the first floor of this block are quarters for two married men, the steward and the porter. Those blocks are two storied, each to contain 40 beds.
A water tower over entrance hall has tankage for two days at 20 gallons per head per diem.

FRONT ELEVATION

NOTE. The external walls are to be of hollow brickwork, of two thickness of 4½ each separated by an air space of 2½, and tied together by wrought iron bending ties.

a.a. Inlets b.b. Outlets

SKETCH OF A 22 BED HOSPITAL.



PLAN

SCALE

We now come to the question as to whether large hospitals are suitable for military purposes in this country. I can at once reply that they are quite suitable for the class of cases treated in them in time of peace. But it is material likewise to consider whether they are equally applicable for the treatment of wounded men in the time of war. This suggests the enquiry as to whether our large permanent hospitals, civil and military, are generally constructed upon the best principles to afford to the inmates the purest air obtainable at the site on which erected.

The advantages of ventilation would hardly seem to require advocacy at the present day: nevertheless, the fact of zymosis appearing sometimes in surgical wards said to be and often actually well-constructed, has caused some degree of scepticism on this head. In the first place, it often occurs that hospitals, the ventilation of which is pronounced excellent in the estimation of their advocates, are found on investigation to be extremely faulty. Again, it cannot be maintained that, under the best possible conditions, pyæmia, gangrene, and erysipelas will never arise. We know that pyæmia much more frequently occurs under recent severe accidents and their sequences than when operations are performed for chronic disease. This alone points to certain constitutional changes largely resulting from sudden impression on nervous centres, which ventilation can only partially influence. Constitutional pre-disposition, habits of life, and epidemic causes, the result of atmospheric states, are well-known agencies which invite the origin of these diseases, notwithstanding good sanitary conditions.

It would seem probable, nay, tolerably certain, that the term "pyæmia" embraces more than one class of disease acknowledging different causes; and the confusion thus introduced is not diminished by the apparently conflicting experiences of practical men. The Surgeon who perceives the development of purulent infection in a private patient placed, perhaps, under the best hygienic conditions, and the Surgeon who watches an outbreak of pyæmia among the wounded in the foul atmosphere of an over-crowded ward, naturally receive very different impressions. To the first, the operation of personal causes appears the dominant influence, just as the evils of a defective hygiene occupy the foremost rank in the mind of the second; and the inference of each would no doubt be correct, for we may probably draw a line of distinction between the cases, let us say, of purulent absorption and deposits, arising out of an osteomyelitis following gunshot injury of bone, and the phenomena which occasionally ensue in persons who have been exposed to the poison of a dissecting-room atmosphere. Absolute immunity from the former cannot be conferred with any degree of certainty by purity of the surrounding atmosphere. It is otherwise, however, with the class of cases that may originate in septic infection.

It is foreign to my purpose to enter into any consideration of the germ theory of disease beyond a remark or two on its bearing on the necessity of pure air in health and disease. It is difficult in the present aspect of the question to avoid confusion, for if living organisms, originators of all the so-called zymotic diseases, are present, under certain conditions, in the atmosphere, and are capable of reproduction to any extent, how are we ever to expect a favourable termination of disease? or how are we to guard against the entrance into the system of protoplasm or, it may be of higher organization, if one is probably always the complement of the air in hospitals, and if the other must, under certain conditions, be constantly present. It would appear almost a hopeless task to procure by any system of ventilation a condition of atmosphere sufficiently pure to avoid germinal impurity. The advocates of the germinal origin of disease, moreover, generally imply that foul air becomes the more fertile nidus for the development of protoplasm; and many hold, when they employ substances, as carbolic acid, which are known to be inimical to the development and destructive to the life of the lower organisms, in the dressing surgical cases, for instance, that they can prevent the fermentative process and subsequent re-production of these beings in the wound. It may be held, moreover, by others, that fresh air would be prophylactic, but that in the best hospitals, or possibly in any hospital, it would be difficult or impossible to obtain such an atmosphere, and that at all events we should reverse the adage, and assume the cure better than prevention, the former being certain, or nearly so, and the latter uncertain, from its impracticability.

There is a very general impression that the extensive employment of carbolic acid during the Franco-German War will afford evidence of the great advantages attending its use; but whether from its pure antiseptic or some other property than that of its destruction of low organisms, is another question.

If we are to accept the germinal origin of disease in its simplest sense, it is difficult to understand why apparently in the case of wounds extent should form so prominent an element in its development. If germs of disease exist in the atmosphere, why should the magnitude of a wound so extensively rule the production of zymosis; for it is almost a law that, unless in circumstances of very depraved health or most impure conditions of atmosphere, wounds of small extent do not give rise to pyæmia! A small wound would afford a nidus for re-production of organic life as surely as a large one, though to a less extent. Nor must it be forgotten that symptoms of pyæmia occasionally ensue under circumstances where the atmospheric air can have had no access to the morbid fluids that set up the disease.

Still more, the well-recognized and remarkable fact of the much greater proclivity of wounds affecting bone to generate suppurative fevers than those of soft parts is at least an impediment to the easy comprehension of a germinal origin. I have seen several gentlemen who were professionally engaged during the Franco-German War, and the evidence of some of them very distinctly characterized this fact. Indeed, one who had great opportunities of judging, said that all the cases of pyæmia that had occurred in his practice were connected with injury of bone, while the most extensive wounds of soft parts in his hospital were exempt from it. But if the idea that carbolic acid or any other chemical agent can become a substitute for pure air, or in other words, that the absence of germs and odour from wounds, obtained by the employment of carbolic acid, is to render us regardless or even less careful of ventilation, it would be a dangerous doctrine. If all the advantages that unquestionably belong to carbolic acid, or that have been claimed for it, are admitted, it will be an invaluable aid in the Surgeon's hands; but neither in medical or surgical wards can any such agent fulfil the fundamental requirement of all hospitals, their thorough ventilation, as the impurities from respiration, and other emanations from the bodies of patients, have to be dealt with by this agency.

The plan of construction of large hospitals, up to a comparatively recent date, would not seem to have followed any very definite system beyond adapting the building to the site and to the number of beds required. The general rule has been to build wards off of passages or halls common to the entire establishment or portions of the establishment. There has not usually been any attempt to provide that the impurities of atmosphere originating in a ward or some other portion of a building should not have access to other wards. And means have not been provided to secure, by night and day and at different seasons, a sufficiently frequent renewal of the air of the ward.

It may probably be the simplest way to consider these defects by illustrations in point. Wards are often met of the following or a nearly similar description:—Room not far from square, windows in one,—the external wall; two opposite walls blank with the exception of a fire-place possibly in both, and the fourth, opposite the external wall, having openings in upper portion communicating with a common passage of the hospital, also a door leading into the passage. What must be the state of ventilation in such a ward containing a number of patients? In summer, the windows during the day are more or less open, but the air may be nearly still; whatever motion it has may not be pressing from the direction of the windows, and the atmosphere outside may be warmer, or differ little in temperature from that within. Diffusion, which will be the chief force in operation, will not sufficiently change the air in such a ward. But suppose a current of air is pressing however feebly, from the passage, the result may be a common ward atmosphere. In winter, when fires are burning, what will be the condition? Were a sufficiency of the windows open, the heat, by creating a difference of density between the air within and that outside, would produce a current which would sufficiently change the air in the ward; but the windows are only occasionally open during the day in winter, and rarely, if ever, at night, and the chief supply

would consequently be derived from the passage common to the entire hospital, brought possibly from any or every ward in the building.

Such a system of common ventilation has been defended upon the ground that if the entire establishment is kept clean and the ventilation is attended to, it is unobjectionable; but, as I have already stated, good ventilation upon such a principle cannot, in my opinion, be obtained. The impediments to this in one ward become multiplied in many; passages, partially closed, in which the change of air at times is slowly and imperfectly effected, and the constant unavoidable sources of foulness in hospitals, all contribute their quota of impurities. Surely, if it can be arranged that each ward of a large hospital has only one (its own) source of impurity, it must be better circumstanced than if liable to many? It is a comparatively easy problem to ventilate one room, large or small, if separate and having structural facilities for doing so.

Another faulty construction that is frequently seen, is a long room with windows at both ends only. Here, when the windows are open, the emanations from the patients to windward must pass over those to leeward, and when the windows are shut, the ventilation cannot be otherwise than bad, if, with the exception of the chimney, there is no direct connection with the open air. The Anglo-American ambulance in the Caserne d'Asfeld at Sedan was an instance of this form of construction. This barrack was used as a hospital, like many others, during the Franco-German war, not from choice but from necessity. It consisted of a number of rooms, side by side, 66 by 24 feet, and 10 feet high, with 24 beds in each, which gave each patient 660 cubic feet. The only apertures in these wards were the large end windows, and doorways about the centre communicating from one ward to the other. It is not to be wondered at that these long wards, so circumstanced, did not afford good results.

The malconstruction of wards might be readily exemplified much further, but it is not necessary to do so; these instances being merely introduced to indicate the nature of the conditions objected to, in contradistinction to the description of ward which appears to me to be the best. I shall confine my remarks exclusively to the general consideration of ward formation and ventilation, without noticing any of the numerous details of hospital construction, not that such details are not of the most material consequence, but they are not within the scope of my intention. I purpose to show, as far as the facts at my disposal enable me to do so, that wards with windows at opposite sides, provided with special apertures for the entrance of fresh air, part of which is warmed before distribution, together with outlet shafts and fireplaces, and constructed on what is commonly known as the pavilion principle, are capable of affording purer air to a number of inmates than wards of other constructions with which I have been able to contrast them. To aid in my doing this it is not necessary to enter into any further description of them, as they are familiar to all. The pavilion plan is now adopted in building Infantry and Cavalry regimental hospitals at home, and the Herbert Hospital is likewise so built. The principle, amongst many merits, enables good natural ventilation to be readily applied, and it precludes the air of one ward obtaining access to others, however numerous they may be.

It may be said that, practically, the system of ventilation adopted in these hospitals might be considered a summer and a winter system; for during the winter the windows are only occasionally open, even in the daytime. The supply of air at this season is therefore mainly dependent upon the apertures specially constructed for the purpose. It is to be understood, however, that the windows are invariably to be opened whenever practicable.

It is found that large apertures for the admission of cold air in winter cannot be endured: a greater amount of air can be borne if supplied subdivided through several small openings than if admitted by larger ones. Hence, we generally employ Sheringham valves of small sectional area, the air admitted by which is subdivided and directed upwards towards the ceiling of wards or barrack-rooms. The area of inlet and outlet apertures necessary for ventilation in hospitals, exclusive of windows, is to some extent a moot point, inasmuch as the requisite amount has been differently stated by different authorities. The Barrack and Hospital Improvement Commission lay down from 28

to 30 square inches per bed. Some consider that the area should depend upon the capacity of the ward, which does not alter, instead of upon the number of beds, which do; but there should be a proportion between the space and occupants in any calculation intended to be definite. Mongolfier's formula is found, from the disturbing causes, to practically mislead. Professor Parkes states as the result of experiment, and Dr. de Chaumont concurs with him, that if 3,000 or more cubic feet of air, per hour, are requisite, it will be necessary to have a sectional inlet area of 24 square inches per bed, and the same for outlet, providing the latter by fireplaces and shafts. In any case, the means of lessening the area of cold-air inlet openings, in very cold or stormy weather, to about six square inches for each bed, should be provided, and to a considerable extent the area of the outlet shafts should also be controllable The means of graduating the admission of air is very requisite, as wards containing certain cases will not require nor admit of such free ventilation as others.

It has been objected to hospitals constructed upon this principle, that they are too cold; but such objections are not tenable. We did not find, during the Crimean War, that free ventilation in our temporary hospitals was injurious. I can vouch for having treated, and seen treated, many cases of inflammatory affections of the chest in such hospitals without injurious effects. Men suffering from bowel affections were most liable to the influences of cold. During the Franco-German war, the soldiers have been very largely exposed to the full effects of the weather, yet up to an advanced period of the winter, the percentage of sick in the well-fed and well-clothed German Army was small. A degree of warmth that is unnecessary for health, however, adds to comfort, and to a reasonable extent should certainly be afforded. In civil life, where the extremes of age, and delicate people, are so largely inmates of hospitals, a greater degree of warmth is requisite; but this can be fully obtained in a well-ventilated building. Double or plate-glass windows tend materially to warmth, and good fires warm the air and improve the ventilation.

It has been matter for discussion whether the windows in our barracks upon this construction might not be advantageously reduced one-third in width, preserving all the advantages of the cross ventilation with a less extent of glass surface, which tends sensibly to diminish the inside temperature during winter.* The supply of fuel is largely ruled from its economical aspect; but there can be no doubt that, both on the grounds of health, comfort, and even morality, it should be adequate at all times to preserve a sufficient temperature.

When referring to the proposed amount of inlet aperture, the area of the air-chamber in connection with the ventilating grate, now in general use in the Army, was included. It is found necessary to heat a portion of the air admitted in cold weather, as without this arrangement so large a distribution of air would lower the temperature too much. These grates have been found on the whole to answer very well. It is to be observed, however, that when the fire is on the lee side of the room, currents of air passing from the windward side are apt to impede the entrance of hot air, and even at times to convert the hot-air flue into an outlet. If outlets are not sufficiently provided, this reverse action of the hot-air flues is liable to occur, inasmuch as, in addition to the direct power of the opposing current, the ward becomes a plenum, the air must find an outlet, and apertures less resisting than the inlet are liable to yield. When well-arranged outlet-shafts of sufficient length, passing through the ceiling, are provided, this is much less likely to occur. Warm air is at all times securely supplied by fire-places in the centre of the ward, to which air-flues are conducted from the outside in apposition with the smoke-flues, and the air, after being warmed by contact with the grates, is delivered into the wards. The area of supply-aperture at the Herbert Hospital, where these fire-places are found to work well, is 8 square inches in the lower and 10 in the upper wards, for every 1,400 cubic feet of ward-space. Taking these as units, it can readily be calculated what would be requisite for any sized ward, and it would also be quite feasible to increase the proportion of warm-air supply if deemed advisable.

* I have ascertained that this has since been acted upon in the erection of the new barracks at Glasgow.

Holding very decided opinions upon the importance of providing air as pure as practicable in barracks and hospitals, the problem has constantly presented itself to me as to whether our present plan of construction and system of ventilation are the best for the purpose.

The space to be provided for each individual has to be determined with the object of affording a sufficiency for the preservation and restoration of health, and at the same time to limit, as far as possible, the expense of so extensive a provision. It has been ruled that, at home and in temperate climates, 600 cubic feet per man in permanent barracks, and 1,200 in permanent hospitals, should be provided as a minimum; but it may be said that, practically, these measurements are at the present day the actual provisions made when new barracks or hospitals are built. Setting aside for the present the question of space as one liable to variation, as the minimum only is limited, I have to consider what means are available for determining the form of construction, and system of ventilation, that we find associated with the purest air. No reliable facts are to be obtained from a comparison of the healthiness of barracks or Army hospitals; but experiments have been made from time to time, for various purposes, by Dr. de Chaumont, Assistant Professor of Hygiene at Netley, showing the purity of the atmosphere in both these classes of buildings of different constructions: at one time, to determine the relative effects of different amounts of cubic space, at another to compare the ventilation of casemates and other barracks, and occasionally to show the relative value of different forms of construction.

Dr. de Chaumont has had great practice in investigations of this kind, and his competency to carry them out is too well known to need any remark from me.

In occupied rooms containing aërial impurities derivable alone from the emanations of the occupants, it is deemed that the measure of the carbonic acid indicates with sufficient certainty the amount of organic matter under such circumstances. Dr. Parkes and Dr. de Chaumont have shown that, taking ·04 per cent. as the initial amount of carbonic acid in the air, the addition of ·02 per cent. is not appreciable to the senses, but that from ·08 to 1 total CO_2 is, the latter very decidedly so.

By a careful examination of the following details of the conditions of the barrack-rooms and hospitals referred to, and of the experiments made in them, I think those in which the best results were obtained will be clearly evident, especially as regards the carbonic acid impurity and the number of times the air was changed.

These experiments were all carried out with closed windows, and, with the exception of those at Anglesea Barracks, in the winter season.

BARRACKS.—WINTER OBSERVATIONS.

I. Windows opposite, at sides.
  a. System of ventilation complete, *i.e.* with inlet apertures, outlet shafts, and ventilating grates.
    Example 1.—Hilsea Royal Artillery Barracks.—Brick huts. Dimensions: length, 60 feet; breadth, 20 feet; height, 9·5 feet; nett cubic space, 13,807 feet. Means of ventilation, 8 opposite windows, 12 air-bricks, 2 outlet shafts, 1 chimney. Occupation, 22 men. Ventilation area per man, 16·6 inches.
  b. System of ventilation incomplete.
    Example.—New Barracks at Chelsea.—A four-storied brick building. Capacity of rooms, 14,400. Mean occupation, 18 men. Means of ventilation: 5 ventilating shafts in the walls; no Sheringham valves as inlets; 1 Galton's stove in centre of side wall; 5 windows, 3 and 2 on opposite sides. Sectional area, 22·4 square inches mean actual occupation; and 16·1 square inches for authorized occupation of 25 men.

II. Windows opposite, at ends.
  a. System of ventilation complete.
    Example 1.—Permanent Barracks, Aldershot (A).—A three-storied brick building, in two blocks fronting each other, having a space

between covered with glass. Rooms examined were three, one above the other, ventilated on the principles of the Barrack Commission. Dimensions: length, 50 feet; breadth, 22 feet; height, 12 feet; nett cubic space, 13,000 feet. Room occupied by 18 men. Means of ventilation: 2 windows at far end; door flanked by windows at opposite end; 4 louvres (2 at each end of room), connected with air-bricks; 2 extraction shafts; 5 small gratings (3 at floor in far end wall, 2 at ceiling in party wall); Galton's stove, with air-chamber and louvre. Mean sectional area per man: 30·8 square inches at actual occupation of 18 men; 23·1 square inches for authorized occupation of 24 men.

b. System of ventilation incomplete.

Example 1.—Permanent Barracks, Aldershot (R).—N.B. These were rooms in the same building as last, but not ventilated on the principles of the Barrack Commission. In all, the grates were of the old pattern, without air-chamber. Sectional ventilation area per man, on actual occupation of 17 men, 14 square inches.

III. Windows not opposite.

Example.—Tower of London.—*These rooms are back to back, and have windows on one side only. An opening has since been made in the party wall, but apparently with little effect.* Dimensions: nett cubic space, about 8,300 feet. Occupied by 15 men. The building is 4 storeys high, and the results are the mean of observations in the 3 lower storeys. Means of ventilation: door at west end; Galton's stove at opposite end; 2 windows at side; opening in party wall opposite; extraction shaft at corner diagonally from door; Sheringham valve into passage at door end; some small gratings (useless). Sectional ventilation area, 23 square inches per man; but this was only nominal, for the Sheringham valve was partially choked and inactive, and extraction shaft shut. Real amount probably was 115 square inches total, or about 8 per man.

ANGLESEY BARRACKS, PORTSEA, AUGUST 1869.

Windows on one side only.—System of Ventilation complete.—These barracks consist of a large block of building, three storys high. In each passage there are four rooms on a floor, two looking to the front or barrack square, and two to back into a narrow yard. Windows on one side only. On the level of the first floor, at the back, there is a balcony which runs the whole length of the block. The rooms experimented on were at the back, on the first floor, with a westerley exposure:—

Dimensions.—Length .... 38 feet. } Area, 798 square feet.
Breadth .... 21 ,, }
Height of wall .... 11 ,,

Ceiling disposed in arches, Calculation gives nett space for 15 men, 9,100 feet, or 607 cubic feet per man.

Ventilating Arrangements.—Door opening into the corner of room nearest the windows. Three windows, each about 40 square feet, are along west side, two valves between windows connected with perforated bricks outside. The apertures of the valves are covered at the sides with perforated zinc, and have a lid or flap which can be opened so as to allow of a direct current. Outlet shaft in corner of the east side at the further end of the room from door, provided with a louvred end, of which part can be closed at pleasure. Fireplace on east side opposite the windows, fitted with Galton's stove and hot-air chamber.

Available sectional area for 15 men, 25 square inches.

Temperature.	November. Hilsea Royal Artillery Barracks.		March. New Barracks Chelsea.		A. Permanent Barracks, Aldershot.		B. Permanent Barracks, Aldershot.		August. Tower of London.		Anglesea Barracks.	
	External.	Internal.	External.	Internal.	External.	Internal.	External.	Internal.	External.	Internal.	External.	Internal,
Dry bulb	55°	57°·9	48°·5	57°·5	40°·8	53°·5	40°·8	57°·6	52°	66°·8	58°·6	69°
Wet „	55°	55°·8	46°	51°·7	38°	49°·4	38°	53°·6	51°·5	61°·6	55°·2	63°·4
Humidity per cent.	100	87	83	66	78	74	78	76	96	71	79	70
Cubic space per man	582		800		722		765†		550		607	
Carbonic acid { External air ..	·424		·400*		·440		·440		·420		·393	
Carbonic acid { Internal air ..	·742		·741		·796		1·107		1·332		1·177 or 198 per cent. over external air.	
Respiratory impurity.. ..	·318		·341		·356		·667		·912			
Actual movement of air, calculated per head, per hour ..	1,885		1,760		1,690		900		665		766	
Number of times air changed per hour	3·25		2·2		2·35		1·16		1·2		1·24	

* Experiment failed: taken at ·400.

† 17 men in room.

In Hilsea and the Chelsea Barracks alone are the windows at opposite sides, but there were no Sheringham valve inlets in the Chelsea rooms; yet, though the cubic space per man was much greater in them, the carbonic acid impurity was larger, and the change of air per hour less than in the Hilsea Barracks.

The permanent barracks (A.) at Aldershot are only 50 feet long with opposite windows at the ends, and the complete system of ventilation recommended by the Barrack and Hospital Commission. Although the plan of windows and apertures at ends is objectionable, it is still of the character of the through system, and the movement is rather better than at Chelsea. But the advantage of the complete system by Sheringham apertures, ventilating grates, and outlet shafts, is seen by comparing the results of A and B rooms.

The barracks at the Tower are shown to be infinitely worse than they might be, from the ventilating openings being partially choked up.

Thus it is evident that the rooms at Hilsea, where alone we have ventilation at opposite sides with the complete system, are much the best ventilated. The absence of inlets and of second fires, necessary from the size of the rooms, together with the large glass surface at Chelsea, (though, in other respects the rooms were of better construction) made the winter observations with closed, but badly-fitting, windows somewhat inferior to Aldershot (A), which had also a larger sectional area of ventilating apertures. These results would, however, have been reversed in summer with open windows.

The experiments at the Anglesea Barracks, Portsmouth, were made in summer, and were only included to show how defective the ventilation with closed windows at that period of the year may be, even with 607 cubic feet and 25 square inches of ventilating aperture per man. It can readily be imagined what would be the condition of the atmosphere of a hospital ward or workhouse of a similar character where special openings for ventilation were not provided.

HOSPITALS.

Windows opposite at the sides, with ventilation system complete.

Example 1. *Hilsea (Pavilion Plan). Nov. 14th*, 1865.—Dimensions of ward, 72½ by 26 feet; height, 14½; cubic space, 28,348. Ward has beds for 20, but occupied by 17 men.

Means of Ventilation.—11 opposite windows; several Sheringham valves, or rather gratings; 2 Galton's stoves; four outlet shafts; 3 outlet tubes over gas. Total of 528 square inches, or 31·06 square inches per head for 17 men.

Example 2. *Herbert Hospital.*—Dimensions of ward, cubic space, 44,355 feet, 119 by 26; height, 14 feet; occupied by 27·5 men (mean); means of ventilation (Pavilion), 16 opposite windows, 18 Sheringham valves, 2 Galton's stoves, 4 extraction shafts, 4 outlets over gas; giving a total of 732 square inches, or about 26·6 square inches per head.

Portsmouth Garrison Hospital.—System with verandah (front), side to the west. Wards arranged on each side of four passages opening out into the verandah. Dimensions of end wards: gross cubic space 11,616 feet; 48 by 22; height, 11; occupied by 17 men. Means of ventilation: in 6 of the middle rooms, opposite windows at the end only—3 louvres, 1 above, and 1 on each side of the door opening into the passage; 4 Sheringham valves adjoining the windows; 2 Arnott's ventilators; 2 outlet shafts in ceiling, near party wall and opposite door; 2 chimneys, and 4 outlets over gas jets; giving a total of 582 square inches ventilation area, or 34 square inches, per head.

End Wards (first floor): Each ward has windows at one side and one end, the front or western end being occupied by a small ward. With this exception, the wards are otherwise all identical in size and arrangement, except in the following details in *ventilating arrangement*:—The Sheringham valves are not opposite, but follow the position of the windows. One outlet shaft only exists, but of wider dimensions (98 square inches). Two louvres only are on the door wall instead of three, as in the others. In the ward at the northern end are two additional Arnott's ventilators in the side wall, where the chimneys pass up from lower rooms. At the southern end ward, there are only two Arnott's ventilators instead of four. Total: northern, 492 square inches, southern, 482 square inches—or 29 square inches per head for the former, and 28 square inches per head for the latter.

Temperature, &c.	November 1865. Hilsea.		November 1865. Herbert Hospital.		Portsmouth Garrison.		
						Internal.	
	External.	Internal.	External.	Internal.	External.	Windows at End opposite.	Windows at one End and on one Side.
Dry bulb	55·3°	60·°	58·°	60·2°	44·8°	61·7°	59·0°
Wet ditto	52·5°	57·6°	56·°	56·9°	42·1°	55·5°	53·0°
Humidity	83	78	87	80	86	66	66
Cubic space per head	1600		1600		..	770	925
Carbonic acid { External air ..	·424		·405		·306		
Carbonic acid { Internal air ..	·625		·578		..	·966	1·015
Carbonic acid impurity from respiration	·201		·173		..	·660	·709
Excess per cent.	47		43		..	216	232
Movement of air per head per hour	3000		3475		..	920	845
Number of times air changed per hour	1·8		2·2		..	1·2	0·9

Dr. de Chaumont states that "the Pavilion buildings are twice as well "ventilated as other forms of buildings, and I have purposely excluded the "observations at Hilsea when the windows were opened, as I was unable to "make corresponding ones at Portsmouth on account of low external tempera- "ture. With windows open at Hilsea the respiratory impurity was only "·048 of carbonic acid per 10,000 volumes, or 6½ per cent. excess over outer "air. All the air was changed no less than nine times in one hour, a result "which it would be hopeless to obtain in a building on the plan of the "Portsmouth Hospital."

These experiments clearly show, that the ventilation of rooms constructed with ventilating apertures on opposite sides is capable of affording a more frequent change of the air within than those of the other constructions with which they have been compared: and that this is the case not only in winter but still more so in summer, for, by opening the upper portion of the windows a current of air will more or less continuously promote a change of atmosphere by diffusion, by direct force of the current, or by its aspirating effect. There appears to be no doubt that this principle of construction is the best. But exception may be taken to these experiments in consequence of their not dealing with organic impurities. I have not taken up this portion of the question, because I have not been able to draw reliable conclusions from the experiments. We are not at present in a position to demonstrate organic impurities in air with the same accuracy as we can carbonic acid. The results of numerous investigations made with great care have given conflicting evidence, and being anxious for accuracy, I have reluctantly omitted to employ them. Although the extent of carbonic acid in room atmosphere is considered to be practically a fair measure of the organic impurity, this cannot be said of the wards of a hospital containing suppurating wounds. If the carbonic acid is more readily dispersed by good ventilation than organic matter, the latter, in its minute condition in air, is no doubt largely dispersed also by the same means, as is rendered evident by bad ventilation and the organic impurity being inappreciable to the sense of smell with good; and whatever may be the extent of the effect of ventilation on the oxidation of organic matter so circumstanced, it is unquestionable that the freer the change of air of a ward by renewal from a pure source the less will be the aërial impurity in that ward.

My experience leads me to prefer small detached buildings, when sufficiently ventilated and otherwise well arranged, to large hospitals for the treatment of the wounded during a period of war. The greater the degree of sub-division, *cæteris paribus*, the less likely, it appears to me, is zymosis to be generated and the easier is it for us to limit its spread.

Nevertheless, we have the experience of the enormous establishments erected during the civil war in America, the general description of which has been previously given, and it would be a mistake in a professedly impartial consideration of this question to pass over without recognition the conclusion to be derived from the very valuable Reports that have been officially published by the American Government on the Sanitary, Medical, and Surgical experience of the war. To quote the words of the Surgeon-General of the American Army, "Never before in the history of "the world has the mortality in military hospitals been so small, and never have "such establishments so completely escaped from disease generated within "their walls." But these hospitals, though of enormous size, and containing 60 patients in a ward, were admirably ventilated.

Staff Surgeon Fitzgerald, who was accredited to the Prussian Government for the purpose of inquiring into their system of medical administration, and of inspecting the various hospitals and other buildings appropriated for the reception of the sick and wounded during the present war, visited a very considerable number of places where hospitals were established. He says, as the general result of his observations, that the sick and wounded appeared to progress more favourably, and that better results were obtained in the case of those patients located in the regularly established hospitals of some size—say, for the accommodation of from 500 to 600 beds—than in the various structures of smaller size used for hospital purposes during the war.

I trust that we shall have official evidence of a reliable and conclusive

character, from the experience obtained during the Franco-German War, as to the suitability or the reverse of large hospitals for the treatment of sick and wounded during a period of hostilities. Yet I cannot but think that, neither in civil nor military life, can large hospitals be properly estimated, unless they are constructed upon such principles as we have been considering, providing segregation of wards with the best means of ventilation. Such hospitals would, I believe, be found suitable for the treatment of wounded, but a large cubic space, probably 2,000 feet per bed, would be requisite. And it would also be necessary to have small separate wards or detached huts for cases of extreme offensiveness, or for those threatened or attacked with zymotic disease. In the large wards of such an institution, containing, say from about 20 to 24 beds each, with the cubic space proposed, it would be quite practicable, even with closed windows in winter, to provide a renewal of the air to the extent of from 4,000 to 5,000 cubic feet, per hour, for each patient, and by opening windows, which should always be done when practicable, this could be largely increased.

I must here observe, that it is practicable to improve many of the different faulty constructions of existing hospitals and wards, and often without a large outlay. It is essential, however, to recognize that the system upon which this should be attempted is to improve the ventilation common to the building generally, and to isolate as far as practicable the ventilation of each ward from that of any other portion of the establishment, at the same time improving the means of aëration of each individual ward.

The first is to be accomplished by opening free communication of all halls and passages with the outer air; and by judicious arrangements much can be done in this respect. In large halls, ventilation through the roof is often practicable, which may be augmented, if necessary, by any of the numerous modes of utilizing heat in this way. Passages, even if ventilated at the ends, should have outlet-shafts passing through the ceiling and roof.

As regards ward arrangement, wherever it is practicable the passage leading to each ward, unless it is an open corridor, should lead to that ward alone and not be common to others. But this would be impracticable in most existing hospitals, and would entail much expense. I may illustrate my meaning, however, by explaining how we improved the condition of some old barracks in this way at no great cost. In some instances, where central corridors existed, we have made one room of the front and back rooms, throwing in the corridor. This has been done through all the rooms of a long range of building, and separate access has been obtained to each room by running an open balcony along the entire of one side, with doors leading from it into each room. This arrangement has increased the space and improved the ventilation in barracks previously of the most faulty construction. York Barracks is a case in point, and the changes contemplated at one time in the Knightsbridge Barracks included this alteration. This answers very well for barrack rooms, if not too long, as free end to end ventilation is thereby obtained, but it would not, for obvious reasons previously alluded to, be advisable in hospital wards. This open balcony, however, might often be cheaply applied in a partial extent to certain portions of buildings suitable for its application, and especially to end wards, which could be thus separately ventilated for the treatment of such surgical or medical cases as would be most appropriately placed in them. In such wards apertures for ventilation might be provided near the floor, capable of being closed when requisite, the air from which might by very simple means be heated before distribution. But care is requisite in supplying cold air in this position in winter, even in wards for fever patients, for which it is usually most needed.

Where wards are placed back to back with windows only at one side of each, horizontal shafts may be run along the ceiling from the outer air at the window side through the partition wall, opening into each ward without communicating with the ward through which they pass. This arrangement provides a cross ventilation, and has been found to answer well and is not expensive.

It would be tedious to discuss the detail of remedies applicable to the various characters of faulty wards. All ventilating openings leading from wards into passages should be closed, and the ventilation derived direct from

the open air. And it may be said generally, that all of them would be improved by the introduction for this purpose of Sheringham valves, or some similar contrivance, and outlet shafts louvred below to prevent down draughts, which are not costly additions. If judiciously placed, they will almost always provide a change in the ward atmosphere, and at night, when the windows are shut, cannot but be of great value. They have been introduced of late years into some of the oldest buildings in military occupation in this country.

I would conclude these remarks by observing that Medical Officers have it in their power to make experiments upon the ventilation of hospitals and barrack-rooms, and that all experience so derived, whether at home or abroad, in different classes and constructions of buildings, cannot fail to be of interest and instruction. Whether in military or civil life, too much light cannot be thrown upon questions involving the provision of the best character of accommodation for the aggregation of numbers, sick or well. If certain conditions are essential in the construction of buildings for such a purpose, it is an error to continue building on wrong principles. If, for instance, on practically testing the air in workhouses or other institutions for the aggregation of numbers, they were found more defective than they might be, it may not be necessary to abandon them, but their errors should be avoided in future constructions. Experiments are easily carried out, and responsible persons should not be deterred from ascertaining the truth. Under such circumstances it is unjustifiable to be satisfied that "where ignorance is bliss it is folly to be wise."

APPENDIX No. III.

QUESTIONS regarding Subsoil Drainage and other improvements of Indian Stations, laid before the Army Sanitary Commission by Dr. Cuningham, Sanitary Commissioner with the Government of India, together with the Replies of Commission.

Introductory Remarks.

Drainage of ground occupied by cantonments involves considerations of health, as well as engineering details. Questions of health and points of detail will probably be found to differ somewhat at almost every station, and no general statement can be made on the subject which could be safely followed as a guide under the ever-varying circumstances which present themselves over so great a country as India.

When this subject was formerly under consideration of the Army Sanitary Commission it was, after mature deliberation, decided that the "suggestions" prepared by the Commission, by request of the Secretary of State for India, should be limited simply to an enunciation of general principles of works, and that the application of those principles should be left to the unfettered judgment of the engineering authorities in India, after a careful local enquiry at each individual station which it was proposed to improve.

The views of the Commission on this point are given in the introduction to their "suggestions", and there is nothing in the present questions which should induce the Commission to depart from them.

Any reply now given regarding drainage of Indian stations must be considered as only explanatory of what has been already stated on this matter in the "suggestions"; but as the application of these principles in any special case must necessarily be influenced by the results of local inquiry, it may be advantageous to preface this reply with a few remarks on those sanitary points which should be ascertained and weighed in regard to all stations which it may be proposed to improve, before any works are planned or executed.

Sanitary improvements must necessarily rest for their justification on sanitary requirements, and these requirements can only be ascertained by a careful study of the locality, including the prevailing diseases, and their causes traced backwards to removable local conditions.

The first step in improving any station must, therefore, be to prepare disease and mortality records for British and Native troops, prisoners, and civil population, so far as it may be practicable to obtain returns of the last of these.

A careful analysis must then be made of the facts in order to ascertain to what diseases the sick and death rates of the locality are due.

In tropical stations generally, the most important diseases are those included under the so-called zymotic class, especially of the miasmatic order.

Much is already known regarding the local favouring conditions of this type of diseases; but in examining Indian stations, some will be found in which the total amount of miasmatic disease is less than in others, and the relative prevalence of single diseases, fevers, cholera, dysentery, &c., will be found to differ at different stations. A careful comparative analysis of local climates, especially as regards daily thermometric range and rainfall, local topographies, and local sanitary conditions of different stations, would no doubt throw much additional light on the whole question of causation, and afford useful data for guiding the sanitary engineer in his work. The relation of distant sources of malaria, often far beyond the boundaries of stations, to the health of troops, and the influence of native populations beyond cantonment boundaries, require very careful consideration in all such local inquiries.

Within the cantonment boundary, and immediately outside it, the points requiring special notice are as follow:—

(*a*) The geological nature and relations of the surface soil and subsoil.

(*b*) The condition of surface and subsoils as to permeability to moisture, prevalence of surface fogs, &c., ascertained during dry, moist, and wet seasons, in relation to the prevailing temperatures of the air and earth.

(*c*) The chemical constitution of surface and subsoils of stations, with special reference to the amount of water and organized matter they contain. Detailed analysis of soils is almost as important in warm climates as the analysis of waters.

Weighing soils before and after drying will give the proportion of water.

Weighing after drying, and again after burning, will give the amount of organic matter sufficiently near for immediate practical purposes.

(*d*) Analysis of water as now being carried out in India.

(*e*) The general configuration of the surface and its levels, with reference to corresponding data for the surrounding district, including the question of natural surface drainage and outfall.

(*f*) The depth of water-line from the surface in wells at different seasons, especially during the rains; but this by itself cannot be depended on as showing the water-level in the subsoil, unless water had ceased to be drawn for a sufficient time to allow the water-level to be restored; *because the well is a* subsoil drainage outlet, and the level of water in it depends on the amount of water drawn. Trial wells or artesian bores made at different points of the surface, and at different seasons, will enable the subsoil water-level to be given with accuracy in plan and section.

The state of river-banks and foreshores at different seasons, as to extent of evaporating surface, rise and fall of water-level, rise and fall of water-level in tanks, jheels, &c.

These elements, when studied with relation to disease and mortality tables, will afford reliable data for discussions on questions of subsoil drainage.

Reports on proposed cantonment improvements should of course include the sanitary state and requirements of adjacent towns and villages, the state of bazaars, cleansing, the condition of buildings, barracks, hospitals, quarters, &c., amount and nature of vegetation, influence of ravines, jheels, nullahs, river-banks, broken ground, nuisances, &c., on the health of troops and civil population. These points require simply to be alluded to here, as the principles on which they should be dealt with have been already sufficiently indicated in the "suggestions" referred to

Supposing that a report on any given cantonment is about to be drawn up after sufficient inquiry on the points briefly indicated above, and that the question of subsoil drainage (as one of the questions only) requires to be decided; we should reply to the queries propounded by the Sanitary Commissioner with the Government of India, at least as far as it is possible to do this without specific local examination, as follows:—

Questions respecting the subsoil drainage of cantonments.

Questions.	Replies.
(*a*) "In what soils, and (*b*) "Under what circumstances is subsoil drainage calculated to improve the health of stations?".	Subsoil drainage in climates with excessive rainfall, can never be depended on by itself to remove rainfall. Heavy rains must pass away over the surface, and the first step in freeing the ground of stations, and in their vicinity, from excess of moisture must be by improving surface conduits and valley lines of outfall for this special object. As much of the rainfall as possible should be passed as rapidly as can be out of the station to a safe outfall by well-formed surface drains, and all holes or hollows where water lies after rain should be levelled, filled up, or drained. When this has been done the question of subsoil drainage becomes narrowed within the limit of freeing the subsoil as quickly as possible from water which has sunk into it, and which cannot by any natural outlet escape with

QUESTIONS. REPLIES.

sufficient rapidity or to such a depth below the surface as to prevent the generation of malaria.

We have pointed out in our "suggestions" that it is not so much the amount of rainfall as the hygrometric condition of the subsoil afterwards, which fosters malaria and malarial diseases.

In selecting new stations, those subsoils which trial holes dug in them show to be wet or water-logged even in wet weather, should be avoided. But in existing stations soils of this class should be subsoil drained on the principles laid down in our "suggestions," and without reference to the character of the subsoil.

Lines of drain tiles require to be laid closer in retentive soils than in porous soils. Where alluvial soils are apt to crack during hot dry weather, precaution should be taken to prevent the drainage tiles being injured or displaced by contraction of the soil.

In loose soils precautions should be taken to prevent the soil passing into the drain tile joints.

The necessity for subsoil drainage in any given case must be determined by the amount of malarial disease, and by the hygrometric condition of the subsoil itself, to be ascertained, as already stated, by trial holes at a sufficient number of points, not only during the dry season, but during the rainy season, and the period following the rainy season.

It does not follow that a subsoil which is apparently dry on a chance examination during a dry season is a healthy subsoil. The quickness or slowness with which the hygrometric level falls below the surface of the ground is an important element in the question of health.

Subsoil drainage is mainly intended to lower the hygrometric level after rainfall as rapidly as possible, and no soil which does not of itself accomplish this result, with as much facility as drain tiles would lead to it, should be left undrained.

Our answer, then, to the first question must be that the need of subsoil drainage at any given station must be decided irrespective of the geological nature of the subsoil, and that wherever the subsoil does not free itself rapidly from moisture after rainfall there should be subsoil drainage.

QUESTION. REPLY.

"Is subsoil drainage useful—

"(*a*) In deep, loose, porous, sandy soils? or,

"(*b*) Where there is no underlying stratum of clay or other impervious medium?"

The reply we have given to the preceding question includes an answer to the present one.

It is not often that towns or stations are built on a perfectly level homogeneous self-draining sand. But if such should be the case, then the reply would be that with proper care and under the topographical conditions supposed, such a subsoil might possibly retain its healthy character (if statistics showed that it was healthy), irrespective of any artificial subsoil drainage.

But if there were irregularities of surface, or slopes, the conditions would be changed, because the rainfall on the higher levels would seek an outlet for itself wherever the outlet was easiest, and it might happen that in a self-draining sandy soil, sloping ground and hollows, especially at the lower levels, might give out malaria and cause disease, because the drainage water had accumulated in such situations.

QUESTIONS. REPLIES.

Instances have not been infrequent where miasmatic diseases have appeared in huts erected on what at first sight was apparently dry self-draining sand, but was found on examination to be damp, for the reasons specified.

The sand on which Aldershot Camp is situated has been drained with advantage, and the sand of Aldershot sewage farm has been improved in the same way. The ground in both cases slopes more or less to an outfall, and it was found that subsoil water had a tendency to crop out or lodge at the lower ends of the camp slopes, indicating its presence in the first instance not by apparent excess of dampness, but by the existence of miasmatic disease among the inmates of huts built on the ground, so that additional drainage precautions had to be taken in the locality.

It is highly probable, besides, that the majority of sandy subsoils are not homogeneous. They are frequently interspersed with soils of other kinds. Clays and the like, very thin layers of which would be sufficient to alter the relations of the sand to rainfall, or porous sands may fill up hollows in other retentive strata at a certain depth below the surface. In either case the sand might become charged with moisture drawn up from the hollows by capillary attraction and give off malaria.

Before it can be said that any sandy soil does not require subsoil drainage it would have to be examined with precisely the same care as any other subsoil and with the precautions already mentioned.

If a flat sandy soil were found tolerably free from organic matter, and if the soil discharged itself of superfluous humidity equally all over, and rapidly after rainfall, then the question might be raised as to whether subsoil drainage was necessary in such a case.

Suppose it were decided that the local conditions were so satisfactory that subsoil drainage was not required, we should then have to consider a well-known fact with regard to soils of this class, namely, that whether these soils continue to be healthy when occupied by stations or towns, or whether they will eventually become very unhealthy, depends entirely on the manner in which the surface is used.

Sand absorbs sewage and foul water with as much facility as it does pure rain water, or pure river water. This absorbing power of sand has led to most serious results to health when feeders have been conducted over its surface for supplying pure water to a town or station from a river or stream, even at a considerable distance. In instances of this kind the first indication of danger in warm climates has generally been, not dampness of subsoil, but severe outbreaks of epidemic diseases. Pure rain water itself will even become foul water before it enters the sand if it falls on refuse filth or other refuse matters left on the surface. Some most severe outbreaks have taken place in dwellings built on sandy soils, and have been traced directly to the foul state of the surface and subsoil from cesspits or from foul water or sewage draining into these porous soils.

An incidental advantage of subsoil draining sandy soils is that it affords to the rainfall a ready means of washing impurities out of the superficial layers of subsoil, and so tends to diminish malaria.

There is hence a special class of requirements incident

QUESTIONS.	REPLIES.
	to the occupation of sandy subsoils, whether they be subsoil drained or not, which are imperative, namely, that the surface should be kept clean, that there should be no cesspits or self-draining manure heaps, and that provision must be made for the continuous removal to a distance of all impurities, solid and fluid, neither of which should ever be allowed to enter the ground.
QUESTION.	REPLY.
"What are the details of the measures by which subsoil drainage should be carried out?"	The general principles of subsoil drainage in relation to surface drainage works are given in our "suggestions" pages 3 and 4. Further details will be found in a minute on the subject prepared and issued by the General Board of Health, copies of which were sent to India by the Army Sanitary Commission, for the use of the Presidency Sanitary Commissions, a number of years ago. The work of Mr. Parks on land drainage may also be consulted with advantage. The whole subject has been thoroughly discussed, and much experience has been obtained in applying subsoil drainage in different soils. The details are of an ordinary engineering character, and come within the scope of the engineer's duties. Like other engineering details, they would have to be worked out on the spot, and under the conditions to which they had to be applied.
QUESTION.	REPLY.
"What extent of ground in the vicinity of the station would it be advisable to embrace in any scheme of subsoil drainage?"	This is a local sanitary question requiring a local answer after a careful inquiry. The primary object of surface and subsoil draining a cantonment is to remove superfluous moisture from the ground under and in the vicinity of barracks, hospitals, and other buildings, so as to diminish the immediate local ground malaria. And there may be positions where cantonment subsoil drainage would be sufficient for these purposes of health. But it is evident that the most perfect subsoil drainage works carried out within the cantonment boundary will not remove excessive moisture or malaria from broken wet surfaces of ground or from malaria-producing ravines or jheels outside the boundary. In such cases subsoil drainage outside the cantonment may not always be necessary; levelling and draining the surface may be sufficient. The effect of ground malaria will diminish with the distance of its source from occupied buildings, other things being equal; but it may still exist, and this to a greater degree, immediately *outside* a cantonment boundary than *within* it. It would not therefore be safe to decide that the subsoil drainage of a cantonment would by itself be sufficient for health without an examination of the vicinity to such distances and in such directions as the configuration of the country may indicate, bearing in mind also that damp or wet ground outside the boundary may be productive of injury to health at a greater distance on the side of a cantonment from which the wind blows during the fever seasons than on other sides. It may be found in such cases that improving watercourses and natural valley lines of outlet, levelling broken ground, filling up pits and holes, and similar improvements in surface drainage, may be sufficient; but there may also be found localities in which the subsoil

QUESTIONS. REPLIES.

is more or less wet, and in such cases subsoil drains may be the only means of removing the water, and should be resorted to.

Cultivation within Cantonments.

When malaria clearly comes from a distance beyond the immediate vicinity of a cantonment, it would have to be dealt with on other principles. In such cases the evil may be diminished by screens of quickly-growing bamboos or trees; but the ultimate improvement of extensive districts of this class can only be expected from larger agricultural drainage works and proper culture and cropping.

"Is it advantageous or otherwise to keep large areas of ground within cantonments denuded of vegetation?

"Would it improve the health of cantonments to encourage vegetation within their limits?

"If so, to what extent, and of what kind of culture?"

It will be better to deal with these questions together, because they all refer to the same point, namely, the influence of culture on health.

It may be safely stated as a general answer to the questions, that wherever in a hot climate there is moisture sufficient to sustain vegetation in any subsoil near human dwellings, the ground had better be cropped; and wherever from peculiar local circumstances, such ground does not admit of being cropped, the healthiness of the locality can be improved by subsoil drainage of the ground.

There are many localities, however, in India as elsewhere, in which no amount of culture will by itself absorb the subsoil moisture to a sufficient depth to keep ground in a healthy condition. In these instances drainage and agriculture must go together.

As a general rule subsoil drainage improves the healthiness of a subsoil not only by withdrawing moisture, but by admitting air into the body of the soil, and so increasing its productive power.

Vegetation promotes dryness by increase of evaporation. It has been calculated that 200 lbs. of water are evaporated to grow one pound of woody fibre either in timber or grass. Vigorous growth on drained or cultivated ground, if so conducted as not to interfere with ventilation, purifies the atmosphere, as well as the subsoil.

It follows from what has been said that subsoil drainage with cropping would be beneficial to the health of most stations.

This must, however, be taken merely as a general statement, because it is quite possible to use ground for crops in such a way as to do harm rather than good, and this risk might be incurred at any Indian station if the culture of ground within or near its limits involved as one of its conditions the locating of a population of native cultivators on the land, and this on account of their filthy habits, or if the culture itself were of an unhealthy character.

The best and safest covering for bare ground near dwellings is grass or some similar crop wherever it will grow.

Vegetables to be used by troops would also be advantageous.

Tall vegetation affording facilites for committing nuisance should be avoided.

Wet culture, that is, culture requiring the ground to be flooded or kept constantly wet, should also be avoided, because wet culture brings on the ground an excess of the very element, namely, water, which it is desirable t remove.

QUESTIONS. REPLIES.

Cultivation would have to be properly regulated as to times and seasons in cases where much movement of earth was necessary.*

Trees properly trained so as to afford shade without interfering with ventilation can be grown with advantage.

In any case provision should be made for the immediate removal to a distance or for burning of all dead vegetation.

The extent to which culture can be introduced into cantonments will depend on the amount of disposable ground not required for parades and other purposes. If culture be introduced at all, there is no reason why the extent should have any limit except that of the area disposable for the purpose.

The entire success or failure of culture as influencing the sanitary condition of a cantonment will depend on the care and system with which it is carried out. It had better never be tried if after having been carefully introduced it is allowed to fall into neglect.

The cultivation of a cantonment should be made ornamental as well as useful, and should be kept so.

QUESTION. REPLY.

"Would irrigation by sewage of cultivated ground within cantonments be advisable?"

The subject of sewage irrigation as applicable for the disposal of barrack sewage was considered by the Commission some years ago, and in the absence of knowledge of local conditions, it was proposed as a general principle that no land should be irrigated within 500 yards of barrack buildings. But the distance in any given case would have to be decided with reference to prevailing winds, to the quantity of sewage, and to the nature of the soil. In hot climates the distance, under corresponding conditions, would have to be greater than in cold climates.

Much additional experience has been recently obtained, tending to show that sewage irrigation, if carefully applied, is a perfectly safe expedient. The sewage farm at Aldershot is about 80 acres in area, and in summer receives the sewage of 12,000 people and 2,286 horses. It lies to leeward of the North Camp, and its edge is 500 yards from the Camp. Occasionally, when the wind blows over the farm towards the Camp, a slight odour is experienced. But the Camp is remarkably healthy. There are a number of instances in England of sewage irrigation from towns and

* The following Algerian experience suggests useful precautions in clearing and cultivating ground in hot climates:—

"The older colonists agreed that though the first work of "clearance and cultivation is invariably attended by fever, much "of this sickness could be avoided by selecting the proper period "for clearing and draining, namely, the colder season, leaving "the land to be baked during the summer heats previous to "actual cultivation, and by sanitary precautions. These consist "in avoiding commencing work till the sun has risen, the use "of generous diet, careful selection of drinking water, good "clothing, ablution, and change of clothing after work, not "living in close vicinity to the work itself, and frequent use of "coffee. With these precautions they asserted that the clear-"ance of waste land and bringing it under cultivation, was not "attended with serious risk to health."—Report on the causes of reduced mortality in the French Army serving in Algeria, p. 20.)

QUESTIONS. REPLIES.

large establishments carried out within 200 or 300 yards of dwellings without appreciable nuisance.

There has as yet been no instance of injury to health from sewage irrigation. One of the healthiest barracks in the United Kingdom is Piershill, immediately outside the walls of which lie the old extensive irrigated meadows receiving the sewage of Edinburgh. Complaints have been made of nuisance from careless application of sewage, but not to any great extent. Living plants are the best "disinfectants" and "deodorizers."

The Madras sewage farm will very shortly afford all the experience required in dealing with the question in India, and it would be better to watch its results before arriving at a decision.

QUESTION.

"Would the use of manure from latrines on such lands, if carefully carried out, be attended with any danger?"

REPLY.

The reply to this question must be similar to the one given respecting sewage irrigation.

Latrine matter can be safely used for manure if it be put into the ground in proper proportion and at a sufficient distance from buildings to avoid nuisance during warm, moist, or rainy weather, and if the ground be cropped at the same time.

There should be no such a thing allowed as burying latrine manure in masses; the proportion of manure applied should be adjusted to the amount of earth and to the requirements of the crop.

The same rules as to direction of prevailing winds, the amount of manure used, the nature of the soil, and the distance from buildings are applicable to this instance as in sewage irrigation.

It is very probable that at many stations the use of latrine manure would necessitate the application of water to the crops, and this circumstance would bring the application of latrine manure under the same conditions and precautions as those necessary for sewage irrigation.

The safest and cheapest way of applying manure to land is, however, in the form of sewage. Manured or sewaged land should be subsoil drained.

As the dry earth system of conservancy has been largely introduced into India, it may be useful to give the comparative value of ordinary town sewage in England where watercloset are in use, and its value where watercloset refuse is excluded from the sewers and separately removed from houses.

The facts are stated in the Report of the Royal Commissioners) Sir William Denison, Dr. Frankland, and Mr. J. C. Morton), on the Pollution of Rivers, vol. 1. The following are the averages:—

COMPOSITION of Sewage in parts per 100,000.

	Total solid matters in solution.	Organic carbon.	Organic nitrogen.	Ammonia.	Nitrogen as nitrates and nitrites.	Total combined nitrogen.	Chlorine.	Suspended matters.		
								Mineral.	Organic.	Total.
37 midden towns	82·4	4·181	1·975	5·435	0	6·451	11·54	17·81	21·30	39·11
0 watercloset towns	72·2	4·696	2·205	6·703	·003	7·728	10·66	24·18	20·51	44·69

QUESTIONS. REPLIES.

The Commissioners continue:—"These analytical numbers show a remarkable similarity of composition between "the sewage of midden towns and that of watercloset "towns. For agricultural purposes 10 tons of average "watercloset sewage may in round numbers be taken "to be equal to 12 tons of average privy sewage." The average quantity of chlorine in 100,000 parts of watercloset sewage is 10·66, while in midden town sewage it is 11·54, indicating the proportion of urine in the sewage, and the influence of the additional water in watercloset towns in diluting it. "The retention of the solid excrements in "the middens is not therefore attended with any considerable diminution in the strength of the sewage. Neither "is the case substantially different where earthclosets are "substituted for Lancashire middens, for the sewage from "Broadmoor Lunatic Asylum, in which these closets are "partially used, exhibits no exceptional degree of weakness."

These facts, resting on a firm scientific basis, have an important bearing, not only on the question of sewage irrigation, but on the question of station drainage in India.

We showed this in our minute on "the dry earth system "of sewage" (March 8th, 1869); and the Royal Commissioners arrive at a similar conclusion in stating that "it "seems hopeless, therefore, to anticipate any substantial "reduction of sewage pollution by dealing with solid excrementitious matters only." It follows that to trust to dry earth conservancy for improving the health of towns, while ordinary station or town drainage is permitted to soak away in cesspits or on the surface is simply to poison the subsoil with sewer water, which, if collected and conveyed in drain pipes would become a valuable manure. The question may now be considered as settled by scientific investigation, that the sewage of inhabited buildings should be treated as a single element, whether as regards health or agriculture, and also that to divide this sewage into two parts, and to remove the parts separately is, as we have stated elsewhere, to pay double where one payment would answer every purpose.

QUESTION. REPLY.

"Where native towns are situated so near cantonments as to prejudice the health of troops, what special measures can practically be taken in regard to these towns, it being borne in mind that there are great difficulties in dealing with native towns which do not exist in] cantonments?"

The causes of unhealthiness of native towns, and the general principles of improvement applicable to them have been already discussed in our "suggestions," but since these were prepared some experience has been obtained in India, especially at Calcutta and Bombay. The procedure at the last-mentioned city appears to have been efficient, if we can judge by its influence on health.

The present question refers not so much to the permanent improvement of native cities and towns as to diminishing the injury caused by them to the health of troops near them, by the adoption of temporary expedients until permanent improvements are carried out.

The reply must therefore be limited to the terms of the question.

No man ought to be permitted in India, any more than he is permitted in England, to use his property or rights in such a way as to injure his neighbour. This is a fundamental principle in the question, and it follows from it that no man can sustain a right to keep a dunghill or a cesspit within his premises, if, by doing so, he injures any one

QUESTIONS. REPLIES.

else; and no man has a right to create a nuisance to the detriment of his neighbour.

Further, it is an admitted principle in British sanitary legislation that a man who creates a nuisance must either abate it himself, or the community must compel him directly or indirectly to abate it.

It appears that at some stations nuisance is experienced from wind passing over native towns near barracks. There is also evidence that injury to health and life arises from this, especially during epidemic seasons.

The chief sources of danger in Indian towns and villages appear to be the state of road surfaces, and of the surface drainage, filthy dwellings and compounds, dungheaps, cesspits, filthy native habits, and, indirectly, impure water, predisposing the people to epidemic attacks near troops.

Bombay experience has shown that it is perfectly possible to deal with these sources of ill health successfully by sanitary police regulations diligently enforced; that people will even improve the surface drainage themselves or have it done at their own cost; that they will submit to be kept clean and pay for it; and that there is little difficulty in inducing them to conform to sanitary precautions if their object be explained, and strict supervision kept up to see that the regulations are carried out. As the final object is to induce the people to attend to their own health and habits, every effort should be made to enlist the feelings of the people on the side of improvement.

Bearing this Bombay experience in mind, the only reply we can give is that indicated above, namely, that all native towns, villages, and bazars near cantonments should be brought under the operation of a rigid cleansing police; that the surface drainage should be improved, the outskirts of towns, villages, and cantonments to a sufficient distance protected from nuisance, and that wells belonging to towns, villages, and bazars should be cleansed, the water supply examined, improved and protected from sources of impurity, or new wells dug where existing wells are irremediably impure.

There is every probability that if these precautions were rigidly enforced in native towns and villages much of the ill health, especially from epidemic diseases, would be removed, both as regards the people themselves and the troops in their vicinity, without the execution of any costly works, although there would be scope after all was done for the introduction of sanitary works, but in most instances these works would be more beneficial to the health of towns themselves, than to the health of cantonments at a distance. There appears to be no reason why the labour for simple sanitary improvements should not be supplied by the people themselves with such assistance as may be necessary.

A few instances of thoroughly improved native towns and villages would do more to enlighten the people on their true interests in this matter than anything else.

Water-Supply.

QUESTION. REPLY.

"Any recent information in regard to sources, works, &c., including the smallest amount of

The most recent information regarding Bengal water sources is that afforded by Dr. Macnamara's Reports.

The results may be stated generally as follow :—

1. That with the exception of a few wells loaded with saline impurities derived from the soil, Bengal waters are

QUESTIONS.	REPLIES.
water per head which should be sufficient to remove barrack impurities by means of pipes, together with means of economizing water, it being borne in mind that as regards the case of nearly all Indian cantonments there are no existing sources which form natural headworks?"	not generally hard waters, and naturally they are good and wholesome in quality. That nevertheless the majority of water sources are more or less polluted by organic and saline matters not due to the sources, but proceeding from the following preventible causes :— (*a.*) Polluted subsoil drainage finding access to wells, from fouling subsoils of stations and towns where wells have been made by sewage and other decomposing matters, cesspits, filthy habits, and the like. (*b.*) Bad methods of drawing and distributing water. Slopping the surface round the well's mouth, and passage of foul water back into the well. Careless and filthy habits of water-drawers using dirty cords and dirty vessels ; water slopped over their feet falling back into wells. (*c.*) Want of protection round and over the mouths of wells, whereby filth, decaying substances, and other impurities obtain access to the water. (*d.*) Suicides and accidental drownings from the same cause. All the drownings in Bombay Presidency in 1868, amounting to 1,608, took place in water sources. Of this number there were 1,101 deaths from accidents and suicides in wells. (*e.*) Carrying, drinking, and cooking water in skins scarcely ever cleaned, and often used for carrying water of bad quality. 3. From these circumstances it follows that well waters are of uncertain constitution, and that so long as the existing sources are left without protection, and are exposed to any risks that may arise from additional subsoil impurity or from careless native habits in drawing and carrying water, so long will the health of persons using the water be exposed to preventible risks. As regards quantity, the Commission has already stated that no more water is required for the purpose of keeping drains clear than is required for the domestic consumption of the population using the drains ; in other words, sewers and drains are simply intended to remove water brought into a station or town for domestic use in an economical and continuous manner, and they are not intended to make any special demand on the water supply for the mere purpose of keeping them free of deposit. The only question therefore is the quantity of water required for domestic use. We have already estimated this for Indian stations at about 12 gallons per head for barracks, and 30 to 35 gallons a head for hospitals per diem ; of this 2½ or 3 gallons per head would be required for waterclosets or latrines, and this amount would have to be deducted if the dry-earth system of conservancy or any similar system of dealing with latrines were adopted. Under certain circumstances it might economise water to use bath water for latrines. It is evident from the local topography of many Indian stations that such a water supply as is here stated must be pumped up either from rivers or from deep wells. India itself has recent examples of several methods of supplying water continuously. Bombay water is provided by head pressure. Madras will be supplied more or less on this principle. Calcutta receives its water from the Hoogly, and filters it.

QUESTIONS. REPLIES.

Deep wells dug in porous strata near rivers, and tunnels carried in porous strata under rivers, have been used in Europe as water sources from which water is raised to a head by pumping.

Water from deep wells dug in any water-bearing strata yielding pure water can be raised by pumping to a sufficient head by stand pipes or water towers. The greater part of the vast population of the metropolis is supplied with water pumped partly from rivers, and a small portion from wells.

The general principles of water supply of Indian stations have been already discussed in our "Suggestions," which contain all the points required for dealing with the engineering aspects of the question.

In draining buildings at very flat stations it is well to provide means of flushing main lines of drainage independently of the action of the flow, but this can be done without additional water by using a small portable tank filled with bath water, and discharging its contents suddenly into the head of the drain.

Various forms of water-tap have been used for economising water, but in practice the least liable to wear and accident is an ordinary water-cock with a weighted handle, which allows water to escape only when it is held up, and stops the escape by simply being let go.

The Commission would repeat here that, as far as has yet come to their knowledge, there is nothing to prevent any military station in India being supplied with water sufficient for all purposes by simple methods long tried by experience, and familiar to engineers who have been engaged in British town improvements.

It may be safely stated also that no population which has once obtained the benefit of a water supply would ever voluntarily revert to the methods at present in use in India, whatever the difference of cost might be, if indeed the difference be not always in favour of supplying water by engineering works. The following data, given long ago in our "Suggestions," illustrate the question of expense:—

"A steam engine working with coals at 20*s.* per ton will "raise 90,000 gallons of water (900,000 lbs. or upwards, or "400 tons in weight) 100 feet high, at a working cost of 1*s.* "One man making six journeys per hour, with two gallons "or 20 lbs. weight, and working at this rate eight hours, "would carry up to an elevation of 100 feet, 96 gallons of "water, or 960 lbs.; so that it would require the united "labour of upwards of 900 men, working eight hours, to "perform 1*s.* worth of steam-engine work, such as is daily "performed at the large waterworks' pumping establish-"ments for London." Small steam engines would not be so economical, but they would be far cheaper than manual labour.

Barracks at Hill Stations.

QUESTIONS.

"What would be the best style of barrack for hill stations, with due regard to elevation and climate?

"What amount of superficial area and cubic space per

REPLY.

The answer to these questions would probably differ somewhat at every hill station. Everything depends on the local climate, elevation, exposure, and locality.

If any hill climate closely resembled those of British home stations, the amount of surface area need not exceed the home allowance, viz., 60 feet. In any semi-tropical climates, such as those at Malta or Gibraltar, the superficial area should not be less than from 70 to 75 feet per bed. This being decided, the cubic space would depend on the

QUESTIONS. REPLIES.

man would be sufficient at hill stations?

"Might the present allowance of 77 square feet be reduced without ill effects?"

height of the room required for comfort at any given station, and this element may safely be left to adjust itself, from experience already obtained in dwelling houses on the hills.

There are certain principles of construction applicable wherever a number of people occupy the same room, which should be observed in these hill barracks as well as in those of similar climates.

1. There should be windows on opposite sides of the room.

2. Each room should have a fire-place. (A drawing of a warm fresh-air grate for burning wood is given in our "Suggestions.")

3. The size of the room will have to be, to some extent, determined by principles of economy as applied to the possibilities of sites available.

4. It is best, wherever practicable, to place barrack and hospital buildings on levelled ridges.

5. If sites must be selected on slopes, barrack and hospital blocks must always be placed with their ends, never with their sides, to the slope. To do the latter is to endanger outbreaks of epidemic disease among the troops. Sloping ground can be dealt with in one of two ways:—

(*a*) It may be terraced so as to enable one end of the barrack-room to be projected away from the slope, leaving a distance of 20 feet between the section of the slope and the end of the room nearest it; and care should be taken to cut off by drains all water descending to the terrace from the higher ground.

(*b*) A platform supported on pillars may be raised on the slope, and the barrack block constructed on it.

Verandahs and jalousies should be provided to protect the walls from excessive sun radiation, and the roofs should be made heat and cold proof, but thoroughly ventilated.

Hospital Accommodation for Native Troops.

We have elsewhere stated that in healthy hill climates barracks may be built with two floors of sleeping rooms.

QUESTION. REPLY.

"What amount of cubic space and superficial area should be given in hospitals for Native troops?"

The principle laid down by the Commission in respect to Native troops in their own country, is that the amount of space and area should be the same as that allowed to British soldiers at home stations.

From 90 to 95 square feet per bed in these hospitals is considered sufficient, and the cubic space per bed would depend on the height of the wards. When a hospital is constructed of small wards, each in a separate building like a hut, a smaller amount of space and area will suffice for health than in a large hospital building containing a number of wards. Local Native customs, in regard to healthy dwellings, will sometimes afford useful indications in providing Native troops with both barracks and hospitals.

Sanitary Apparatus.

QUESTION. REPLY.

"Would it not be desirable to send to India a collection of specimens of sanitary apparatus?"

It would be very important to do so. There should be a collection kept for reference at the capital of each Presidency, showing the various kinds and sizes of agricultural tile-drains, drain-pipes, lavatory and bath apparatus, cooking apparatus, urinals, latrines, water-closets, sinks, water-pipes, cocks, hydrants, filters, manhole frames and covers, side-entrance frames and covers, sewer-flushing apparatus, &c. More practical information would be ob

QUESTIONS. REPLIES.

tained by an inspection of apparatus of this class than from either descriptions or drawings.

Statistics.

QUESTION.

"Would it not be advisable to make arrangements whereby the movement of disease and mortality in India, especially from epidemics, should be concentrated for the information of the Government of India?"

REPLY.

It is necessary for the purposes of efficient control, and to ensure correctness, that each Presidency or Government should obtain, classify, and publish its own statistics in the manner now carried out in the three divisions of the United Kingdom and in the British Colonies.

This is the only way in which efficiency can be obtained; but it is attended with some disadvantage, inasmuch as there is no common centre to which all the statistics can be transmitted, and comparisons made for public purposes, so that the movement of disease over the vast area of Her Majesty's dominions is never accurately known. This kind of knowledge is especially necessary in India, because although epidemics generally follow the same course in each division to the country, these destructive diseases may move in subservience to a common law, which it is of great importance to arrive at. At the present moment the want of correct information, in regard to the movement of cholera in India, is greatly felt; and the instructions issued by the Commission for conducting the enquiry now going on into this disease, take for granted that the facts of movement can be ascertained, and rendered available for constant use by the Government of India.

This information could be obtained, however, without interfering with the local machinery by which statistics are collected. We consider it very desirable that the Supreme Government should be kept constantly informed as to the places, dates of appearance, and movements of all epidemic diseases, especially of cholera, throughout the entire extent of India.

We have stated in the instructions the statistical points of most importance as regards troops, prisoners, and civil population; and we have no doubt that arrangements could be made for the transmission of this information from all points of the country, through such channels and at such times as the Government may consider suitable, and for its frequent publication.

QUESTION.

"Has the Commission any special suggestion to make regarding measures to be taken when stations are invaded or threatened with cholera, or regarding the evacuation of the affected places?"

REPLY.

The Commission has had this subject recently under consideration, with reference to Dr. Murray's Report on the treatment of cholera; and their views, as deduced from the most recent experience of 500 Medical Officers in India on this subject, given by Dr. Murray, are embodied in a special minute already sent to the Secretary of State for War and the Secretary of State for India.

Regimental Arrangements.

The questions under this head were considered by the Royal Commission on the Sanitary State of the Indian Army, and answers were given on the general principles involved in the questions. The Commission have, however, considered it advisable to communicate with the Director-General of the Army Medical Department, and he has been good enough to place at their disposal the

QUESTIONS. REPLIES.

latest information and experience on the subject.* It will be seen that the evidence on which the Royal Sanitary Commission reported has been confirmed by subsequent experience, and that all the facts point in the same direction.

QUESTION.

"What should be the composition of regiments sent to India, to avoid the losses consequent on allowing unsuitable men to go there?"

REPLY.

To this question the Royal Commission on the Sanitary State of the Indian Army gave the following reply (8vo Report, p. 126) :—

"That no recruit be sent to India under 21 years of age, "nor until he has completed his drill at home, and that "recruits be sent direct from home to India so as to land "there early in November."

This recommendation does not appear to have been carried into effect.

Reports from Medical Officers of the highest rank and experience in India still point out too early service in India as a powerful predisposing cause of disease.

Inspector-General Dr. Muir states that one pregnant cause of the high rates of sickness and mortality among the European troops in India is the large number of boys and growing lads who are sent out.

The following Table gives the facts for four regiments lately sent out :—

Regiments.	Number under 20 Years of Age.	Number of Recruits not yet Discharged Drill.
92nd	239	116
1st Bn. 6th	165	13
85th	155	96
2nd Bn. 60th ..	163	9

The last two regiments were quartered at Calcutta and Meean Meer, both peculiarly malarious localities.

Inspector-General Dr. Beatson has expressed a similar opinion as the result of his Indian experience. "It is true that statistics show a less mortality at the younger ages of soldiers, but this is only an apparent advantage on the side of youth, as it resolves itself simply into a clear statement that the longer the residence in India the greater the mortality. To make a test of mortality, the men of the different ages contrasted should have served the same time in India; but the experience of Medical Officers is, that sending unformed soldiers to India is one potent cause not of high death rates in the year or two after their arrival, but of a higher death and inefficiency rate in subsequent years, from the resisting power of their constitutions having been unduly weakened during the first year or two of immature service.

The Director-General informs us that he has received lately numerous reports deprecating sending young and delicate soldiers to India. The 92nd Highlanders suffered from typhoid fever soon after reaching India. This disease prevailed chiefly among the youths, who, as the preceding Table shows, were in large proportion in the regiment. To

* *See* Appendix, page 272.

QUESTIONS.

REPLIES.

this fact Deputy Inspector-General Monro attributes much of the prevalence of the disease. Immature men of the 21st Fusiliers were the chief sufferers from malarial fever at Kurrachee, and on unformed constitutions in the 62nd Regiment at Lucknow fell a large proportion of sickness, including cholera.

Many other instances might be adduced of similar results, but the fact is well known.

French experience in Algeria is to the effect that a soldier stands the conditions of service in that country with least damage at the age of 25. (Report on the Causes of Reduced Mortality in the French Army serving in Algeria, p. 34.)

On considering the question in light of most recent experience, the Commission adhere to the recommendations of the Royal Commission on the Sanitary State of the Indian Army quoted above.

QUESTION.

"What arrangements could be made to ensure the arrival of troops in India at the proper season?"

REPLY.

The terms of the question are such as to render a direct reply very difficult.

There is no difference of opinion on the propriety of landing troops in India within the last two months of the year. To land them later, especially for service on the plains, is to incur a certain risk to health and life, which might be avoided if they were landed in November or December.

But when a large force has to be collected, conveyed by sea, and distributed over so great a country as India within so short a time, and when this process has to be continued year after year, it is evident that a larger cost must be incurred than would be necessary if time was not an object.

It is a question of cost of efficiency against cost of transport; but it is part also of a larger question—namely, the rotation of stations.

The general principle for adoption would apparently be to send out the troops for the most distant and least accessible stations first, and to locate those arriving latest at healthier stations, most easily accessible from the port of disembarkation. It is a well-recognized fact that regiments suffer more the first year after arrival in India than subsequently, unless in the case of an epidemic invasion. Instances to the contrary, no doubt, may be found, but it is nevertheless a fact.

If as many of the most unhealthy stations as possible were abandoned, and if all troops on arrival were sent direct to hill stations, the time of landing would matter less than at present, because at whatever time the troops might reach India, they would, with improved means of communication, be within easy distance of healthy climates.

QUESTION.

"Also the departure of invalids from India, so as to ensure their arrival at the proper season in England, and their selection at the most favourable time in India. The

REPLY.

Everything connected with the movement of men in India has undergone such changes of recent years, that the present times of invaliding might be re-arranged with great advantage.

From information placed by the Director-General at the disposal of the Commission, especially from statements made by Inspector-General Beatson, Principal Medical Officer at Netley, it appears:—

That many men arrive at Netley as invalids who ought

QUESTIONS.	REPLIES.
present system is faulty on both heads?"	never to have left India. This occurrence is attributed to the fact that men who have been worn down by the heat of summer look so ill at the end of the hot season as to justify the belief that they really require a change; whereas many of them, during the cold season, would be so much improved as to be scarcely recognized at its termination. It is hence considered that the Invaliding Boards should sit at the end or beginning of the year instead of in October, the present time for these Boards, which was fixed when the means of locomotion in India were widely different from what thay are now. Another great evil arising from the existing invaliding arrangements is that men whose constitutions are shattered, or who are labouring under organic diseases, are embarked at such times as to arrive in the cold weather in England, to the imminent danger of health and life. The "Crocodile" arrived on the 12th January last with invalids from India. There was a great mortality from pneumonia among them on the passage home, and after the men arrived in England. This was directly the result of too rapid change of climate. It is simply repeating a well-known fact to state that one of the most dangerous experiments which an invalid with chronic disease, or diseased susceptibility of chest or abdominal organs, can make, is that of coming from a warm climate into an English winter or cold spring. Any man who can stand such a change without injury is scarcely an invalid. The Commission would recommend for consideration that invalids should be passed at such times as would enable them, after receiving their papers and reaching the port of embarkation, to go on board so as to arrive in England not earlier than April. They would further recommend that Medical Officers should be required to certify whether particular cases should not be transferred to the hospital at Suez, which should be utilised as far as its limited accommodation (forty beds) permits, and detained there so as to enable them to reach England at a later date during the summer weather. As it appears from the facts laid before the Commission that preventible suffering and risk have been incurred by invalids from want of clothing suitable for the rapid changes of temperature while proceeding northwards, the Commission would recommend the issue of additional articles of clothing being made at Suez.
QUESTION.	REPLY.
"As no general plan at present exists for locating troops at suitable stations on their first arrival in India, and for a tour of duty thereafter, so as to render their service in the country as little hurtful to health as practicable, would it not be advisable	The Royal Commission on the Sanitary State of the Indian Army, after fully considering this subject, arrived at the following general conclusions as to what ought to be the basis of improved conditions of service in India (8vo. Report, page 114):— "1. To reduce to a minimum the strategic points on "the alluvial plains, and to hold in force as few unhealthy "stations as possible. "2. To locate a third part of the force required to hold "these points on the nearest convenient hill station or ele- "vated plain. "3. Never to trust to simple elevation as a means of "protecting health, but while occupying the best available "elevated stations, to place these (for they want it just as

QUESTIONS.	REPLIES.
specially to consider the subject, and to lay down some special practical plan, to be carried out so far as the exigencies of the service admit of?"	"much as stations on the plains) in the very best sanitary "condition." It will be seen that the occupation of hill stations by a third of the force was considered by the Royal Commission as the fundamental condition of improvement. Sir W. Mansfield, in a recent speech at the delivery of the annual Budget, is said to have referred to the location of troops, and stated that it was with great satisfaction he had been able to urge on the completion of the hill military stations at Chukrata and Raneekhet. The mortality in hill stations was insignificant compared with that in other parts of India, and he thought that arrangements should be made for the location of three more British regiments at hill stations, so that one-fourth of the entire British force might be always stationed in the Himalayas. There were great military reserves and advantages now existing in the country, such as facilities of communication by which armies could be brought together in the least possible time, which were altogether unknown to their predecessors. Information supplied to the Commission by the Director-General shows that experience obtained since the date of the Royal Commission Report is altogether to the same purport.* The following is the ordinary routine of movement :— A regiment arrives at Calcutta from England, and is sent to an up-country station, and thence moves onwards to Peshawur, thence to Central India or to Bengal. If the regiment arrives at Bombay, it is sent to the Punjaub, moves eventually to Peshawur, thence to the North-West or to Oudh, and perhaps to a hill station, and thence to Central India. The Commission can of course only look on the effects this method of proceeding is likely to have on the health of regiments. It is an axiom that no regiment which has suffered from malarial disease at a malarial station ought to be moved into another malarial station, still less into a station more unhealthy than the one it has been suffering in before removal. It has unfortunately happened that the most malarial station in India, Peshawur, lies in the tour of duty of corps proceeding from other malarial stations, and this no doubt has been one cause of the excessive losses of regiments in the Peshawur valley. There appears to be no regular tour to hill stations, and neither recruits nor newly arrived regiments are sent there. Within the last few years some regiments have been twice at hill stations, one has been three times, others not at all. The difficulties of introducing a regular rotation of stations, including hill stations, are not to be underrated. They are no doubt considerable, but with the experience obtained in India of late years they ought not to be insurmountable. As to the necessity of some improved arrangements of stations there can be no doubt. The utilization of hill stations to the largest extent being recognized as a prime necessity for the maintenance of the health of European soldiers in India, it is urged that some system to obtain this should be instituted. The evi-

* *Vide* Appendix, page 272

QUESTIONS. REPLIES.

dence submitted to us goes to establish the fact, heretofore very generally admitted, that the real value of the mountain regions of India is in preserving health, and that their curative powers are comparatively small, especially to the subjects of organic disease.

Were this knowledge acted upon, it would follow that the present barracks for convalescent depôts in the hills might be chiefly used for regiments or wings of regiments, or newly arrived drafts: additions might readily be made to some of them for this purpose. Were the period for invaliding changed from October to January it might nearly always be determined what men would be likely to recover by remaining in the plains or by removal to the hills, and whom it would be advisable to send home: and were the principle recognized that sufferers from organic disease of any importance, and those whose constitutions had been seriously impaired, should be invalided to England instead of to the hills, the requirement of the latter as resorts for invalids would be greatly diminished.

The Commission are of opinion that, for purposes of health, regiments on first arrival in India should be sent to the hills to spend their two first years' service there, and that the hill stations should be of sufficient number and capacity to accommodate one-third of the European force serving in India, by which every regiment should serve two years in the hills for every four in the plains. It is not intended that men should be kept idle. Evidence has been produced showing clearly the remarkable degree of health enjoyed by working parties employed chiefly on road-making in the mountains; wherefore it is believed that additions to present barracks, and even new ones, might be mainly made by the men themselves with great advantage to their health, and this occupation would not interfere with their military employment during the winter. Every hill station might, in addition to accommodation for a regiment, provide for 150 invalids.

Invaliding sufferers from organic disease to England in the first instance, instead of sending them to gain but little in the hills, prior in so many cases to final removal to England, together with the proposed rotation system of all regiments to the hills, would render such provision for weakly men sufficient, and obviate the expense of separate establishments.

The Commission do not fail to recognize a difficulty regarding this provision for drafts on arrival from England, but would suggest, as far as practicable, the same principle being adopted as for regiments on first arrival in the country.

QUESTION. REPLY.

"Should not arrangements be made for sending sickly men at once to the hills during the hot and rainy seasons?"

The Royal Sanitary Commission's Report very wisely remarks:—"As regards disease, the mountains of India "are but partially curative." Moreover, it is more than doubtful that a move from a distance to the hills, even by rail, in the hot weather, would benefit a man seriously ill. Such moves should be undertaken with extreme caution. A sudden change to the cold and damp of the hills, of a sufferer from acute or sub-acute disease of the liver or bowels, would be a hazardous procedure; whether justifiable in individual cases it is difficult to say, but as a general practice it does not seem a safe expedient.

QUESTIONS. REPLIES.

Sufferers from certain forms of disease, at stations close to the hills, might no doubt often be removed to the hills with advantage.

Scientific Inquiry into Cholera.

QUESTION.

"With reference to the scientific branch of the cholera inquiry in India, would it not be desirable to supplement the Instructions drawn up by the Army Sanitary Commission by a few suggestions as to the best method of conducting and carrying out the inquiry? And would it not be important to connect Drs. Lewis and Cunningham, either directly or indirectly, with the Home authorities, so that any difficulties occurring in the course of their investigation might be promptly met, and scientific details communicated early?"

REPLY.

The Commission, in their Instructions for the Indian cholera inquiry, and in the accompanying Memorandum, expressed their opinion that the details of the inquiry should be left to the authorities in India. They merely stated generally in what manner the Reports should be transmitted from observers in India to the Indian Government, and thence to the India Office at home.

The present question refers specially to the scientific portion of the investigation, and the manner of reporting and checking the results.

While giving the following reply to the points in the question, the Commission must be understood as abstaining from all dictation in the matter. Their object is simply to afford to the authorities in India the means of arriving at such an arrangement regarding the work as may facilitate its execution.

Section No. VI. of the Instructions (Special Local Inquiry) is subdivided under the following heads:—

1. Microscopic examinatian of the external atmosphere.
2. Examination of soils.
3. Microscopic examination of water.
4. Microscopic examination of articles of food.
5. Microscopic examination into the pathology of cholera.
6. Microscopic and physiological inquiry into the cause of cholera.

Each of these heads contains two distinct sets of investigations intended to check each other. One has reference to the normal condition of the objects submitted to examination at times and places where cholera is absent, and the other at times and places where cholera is present in varying degrees of intensity.

To conduct inquiries on these points necessitates an organized direction and procedure. They would be very inefficiently carried out unless some general plan were laid down and acted on. One of the objects in sending two trained officers to India for the purposes of the investigation, was, that instead of trusting to desultory observations made by Medical Officers, most of whose time is already more or less occupied with other work, two specially-trained observers, kept constantly on this service, would acquire increasing facility and experience in dealing with its objects, so that in due time all the light which modern scientific methods could throw on the subjects of investigation might be obtained and rendered available for public purposes.

The whole inquiry is so framed that theory or hypothesis are no parts of it. There is nothing wanted from it at present but carefully-observed facts, in the hope that these facts will in time range themselves under general laws indicating the means of saving life.

With this view, each section of the inquiry throughout the Instructions contains points depending for their eluci-

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dation more or less on the scientific data to be acquired under Sections VI. and VII. The questions are so arranged that the replies will check each other, so that fresh investigations may be directed to clear up any doubtful points when requisite.

The fundamental condition, therefore, of the entire procedure is that the Instructions *should* be taken as a whole, and complied with as far as practicable.

Copies of them should be put into the hands of every officer engaged in any branch of the inquiry, with a request that in replying to, or giving information on any question or questions, he should attend to the precautions indicated for avoiding errors in observation, and reply as closely as possible in the terms of the questions. Facts may present themselves, regarding which other and more special questions may have to be asked, but such questions will suggest themselves when the occasion arises.

The Commission, considering it of great importance that some arrangement should be come to for insuring a systematic direction of the inquiry, and for reporting the results, would suggest that there should be some officer or committee appointed to select localities at which it would be advisable to place the trained observers, and to make the necessary arrangements for conducting observations under the Instructions.

It is a matter of obvious necessity that, as a rule, the observers should not be taken away from any locality at which they may have been placed, or from any inquiry they may have entered on, until they have completed their work there.

The Commission would suggest that the ordinary every-day work of the scientific observers should be directed towards obtaining normal constants of healthy localities. It is quite as important to obtain a true picture of the natural condition of healthy air, soils, waters, articles of food, organized structures, *post-mortem* appearances, &c., when there is no cholera, as it is to obtain a picture of the same objects during a cholera epidemic.

A similar remark applies with equal force to inquiries into the same class of facts in localities where cholera is always absent, and in localities where it is always endemic.

One advantage of this procedure would be that when cholera was about to invade any locality in which the observer happened to be at work at the time, he might have the opportunity of watching any changes in the objects under daily observation.

The observers could always be transferred to localities where cholera *had broken out, there to conduct special observations called for by the appearance of the disease; but in all changes of the field* or of the subjects of observation, the observers themselves should be consulted.

Reports might be called for on any part of the Instructions at stated times; or special inquiries and reports on any section or portion of a section of the Instructions, or specific replies to specific questions contained in the Instructions, might be called for.

For example, reports with drawings might be furnished by the two scientific observers on each division of their section in localities where cholera is absent, and again where it is present.

It is most important also that reports and illustrative

QUESTIONS. REPLIES.

drawings should be printed as soon as possible after being laid before the Government of India.

No attempt should be made to report on the results of the inquiry until a sufficient number of facts and a sufficiency of experience has been accumulated and printed, to enable all persons interested in the subject to form their own opinions.

Copies of these printed reports should be sent to the India Office at home as soon as practicable.

If deemed to be desirable by the authorities in India, the Army Sanitary Commission would willingly place itself in direct communication with any officer or committee appointed to direct the inquiries in India, or with the observers themselves, so that any difficulties met with by the observers, and any points or questions regarding improved methods of inquiry, or as to the precise nature of objects discovered under the microscope, might be promptly dealt with.

J. HOPE GRANT, Q.M.G., and President.
DOUGLAS GALTON.
JOHN SUTHERLAND.
H. H. MASSY.
T. A. L. MURRAY.
W. E. BAKER.
J. R. MARTIN.
ROBERT RAWLINSON.

J. J. FREDERICK, *Secretary.*

Army Sanitary Commission, War Office,
July 8, 1870.

REPLIES to Queries from the Army Sanitary Commission, regarding Regimental Arrangements in India.

By the Director-General of the Army Medical Department.

I cannot, I think, better reply to the queries put to me by the Army Sanitary Commission than by forwarding a letter from Inspector-General Dr. Muir, at present Principal Medical Officer of Her Majesty's British troops in India, and extracts from a letter forwarded to me by Inspector-General Dr. Beatson, late Principal Medical Officer, British Troops in India. I may say I quite concur with both these officers generally in their views, both on account of the soundness of the principles they inculcate, and from the fact that the position that one of them now fills, and the other did lately fill, gives them an unparalleled practical experience which is enhanced by the well-known clear judgment of both of them. Without entering into the queries in detail, I will only offer a few general remarks, as I think Dr. Beatson's and Dr. Muir's communications include nearly everything needed.

Composition of regiments for India.

1. I beg to attach a Statistical Table showing the mortality of European soldiers at different ages in India; but, as Dr. Beatson remarks, it indicates the effects of climate from length of service in India, not really by age. I may add that I have received lately from numerous Medical Officers in India, reports deprecating the

sending out to India young and delicate soldiers. The 92nd Highlanders suffered from typhoid fever soon after reaching India, and Deputy-Inspector General Munro largely attributes it to the immature age of the large proportion of the men amongst whom it chiefly prevailed. A similar complaint is made regarding the 21st Fusiliers, by a Board which reported upon the great prevalence of malarious fever in the regiment while at Kurrachee; and Deputy Inspector-General Menzies makes a very decided statement to this effect as regards the 62nd Regiment stationed at Lucknow, which suffered much from sickness, including cholera. These are only a few instances amongst many. I am fully of opinion soldiers should not embark for service in India under 20 years of age, and that even immature men of 20 should be held over for still longer.

Arrangements for arrival in India at proper season.

2. This has been very pertinently replied to by Dr. Beatson, and from November to January is no doubt the best season for troops to reach India. If, however, a certain force is to be moved in a limited time by a limited number of transports, there seems very little scope for arrangement. The general principle would be to send out the troops for the most distant and least accessible stations first, and to locate those arriving latest in healthy stations close and accessible to the port of disembarkation. Were Dr. Muir and Dr. Beatson's propositions, to send all regiments on first arrival in India to the hills, carried out, there would be no difficulty in the matter; but until the provision of these stations is made somewhat as Dr. Beatson proposes, the arrangement cannot be carried out in its entirety, but so far as it can, in the meantime, it would be all important to introduce the principle, and locate as many of the European troops as possible in the mountain ranges; and the proposal that all regiments should spend their first two years of Indian service in the hills, and the subsequent rotation of plain and hill service, is calculated t be of the very highest value in its health aspect to the European soldier. It is fairly deducible that, if the European soldier is placed in the hills where heat is not felt, and malaria reduced to a minimum, a considerable step towards assimilating his position to that to which he has been accustomed in his own country will be obtained. The great experience that a long series of years has afforded of the healthiness of the hill stations in the Bengal Presidency, from the residence there of civil and military servants of the State, shows that these localities would be very influential in preserving the health of Europeans reaching them in health. Though not the European's climate, they approach it, and, probably, in no indication is this more clearly evidenced than in the effects upon European children, who thrive wonderfully in some of the hills, presenting the ruddy healthy look of the most favoured regions of Europe. If the principle of sending regiments to hill stations on their first arrival in India were adopted, it is probable that, up to a late period, they might be conveyed by rail to within an easy distance of the Bengal hill stations. And arrangements might be made for the latest arrivals each season to reach Jakatala or Bangalore, in the Madras Presidency from Bombay, via Beypoor, by water, and from thence by rail. I do not quite concur with Dr. Muir as to the plan he recommends of confining regiments to provinces or districts, as by such arrangement some regiments might be doomed to spend the time they occupy stations in the plains in exceptionally unhealthy climates. Thus, regiments in Lower Bengal, or portions of Central India, would be very badly placed in comparison with regiments serving in less malarious places.

It would seem more judicious to move them about, all taking their turn of the less healthy stations, but not proceeding from one to another unhealthy station. I am not in accord with Dr. Muir in his disapproval of marching troops in the cold season. It is no doubt attended with expense, but the experience derived from campaigning in India clearly points to great advantage to the health of the men from the exercise, and change of scene and air, and of mode of life, which are associated with marching in the cold weather.

Period for selection of invalids in India, and proper season of arrival in England.

3. The proposal of Dr Beatson on this head is deserving of careful consideration. Some time ago I brought the matter to the notice of the Principal Medical Officer in India. The "Crocodile" arrived on 12th January last, and the great mortality amongst sickly men from India on

her passage home, and after the men reached this country, very forcibly impressed this subject upon me. There is no doubt that men who are in debilitated health, or the subjects of many forms of organic disease, the result of service in Iadia are very liable to have their condition greatly aggravated by arriving in this country in the winter.

It might be possible to arrange one other passage homewards annually by the overland troop ships for invalids.

When invalids are sent home in the winter by overland route, the hospital at Suez should be used to the extent of its accommodation for such cases as would be likely to suffer by reaching England during the winter.

4. My remarks upon this query are included under No. 2.

Hill stations.

5. I have nothing to add to the observations of Dr. Beatson on this question.

T. G. LOGAN, *Director-General,*
Army Medical Department.

6th May, 1870

ABSTRACT showing the Ages of the Troops serving in Bengal, Madras, and Bombay, and the Deaths at each Age, during the Year 1868, &c.

STATION.	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.	
	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.	Strength on 1st Jan.	Died.
Bengal	1,493	22	8,123	132	12,019	200	6,267	181	2,011	82	362	19
Madras	317	4	2,253	18	3,896	92	1,881	74	595	24	113	8
Bombay	448	3	1,988	30	2,775	27	2,030	47	671	20	90	5
Total	2,258	29	12,364	180	18,690	319	10,178	302	3,277	126	565	32
Ratio of deaths per 1,000 of strength ..	12·84		14·56		17·07		29·67		38·45		56·64	
Ratio of deaths per 1,000 of strength in Bengal, 1862–66; Madras and Bombay, 1861–66	7·68		16·11		24·64		32·18		41·94		56·01	

Medical Department, British Troops, Inspector-General's Office,

Sir, *Calcutta, 31st December,* 1869.

In continuation of previous correspondence, I have the honour to offer the following observations for the consideration of His Excellency the Governor-General in Council.

In these days of retrenchment it will, I think, be readily conceded that no economy is more real and vital than that which reduces the sick rate of the British force serving in this country.

A sick soldier is an expensive article. He requires medicines and medical comforts to be provided for him; doctors and medical establishments to be kept up for him; hill sanitaria to be maintained for his convalescence, and costly transports for his removal to England when such becomes necessary.

The following suggestions are submitted in the belief that, if acted upon, economy in the saving of life and health (to take no higher view) will result.

Young soldiers.

I. One pregnant cause of the high ratio of sickness and mortality among the European troops in this country is the large number of boys or growing lads who are sent out to fill its ranks.

To take, in illustration of this statement, four regiments out of those which arrived last year, the following Table will show that nearly one-fourth of the aggregate numbers consisted of lads under 20 years of age :—

Regiments.	No. under 20 years of age.	No. of Recruits not yet discharged drill.
92nd ..	239	116
1st Bn. 6th ..	165	13
85th.. ..	155	96
2nd Bn. 60th	163	9

Now, it is a fact, substantiated by all experience, military and medical, that soldiers of immature age and development do not thrive when transplanted to the plains of India. Of what avail are our expensive new barracks, our advanced sanitation, and all the means and appliances so liberally provided by Government for the preservation of the health of the European soldier, if so large a proportion consists of such delicate material. If, as I understand, the Government of India is charged with the maintenance of Indian depôts in England, surely it has a right to demand that no soldier be embarked for service in India who has not completed 20 years of age.

There is another point connected with this head also worthy of attention; viz., the return of invalided soldiers to India before they have had time completely to recover their health by the change to England. Of this we have very recently had an instance in the case of several men of the 26th Regiment who were sent home a year ago, returned to India in October last, and are about to go back again to England during the present or next month as invalids. Although this point has been taken up and pressed by the Medical Department, it would seem that the authoritative interposition of the Government of India, is still wanted to ensure a stop being put to a practice so shortsighted and wasteful of public money.

Mode of relief.

II. Is the mode in which European regiments are brought into this country, and afterwards moved from station to station in the course of reliefs, that most consistent with considerations of health and economy?

Putting aside for the present the military and political aspects of the question, let us see what is the ordinary routine in these movements.

A regiment arrives at Calcutta from England, and is sent up to some station in the North-west, or Punjaub,—as Agra, Meerut, or Lucknow,—and thence works its way up to Peshawur, whence it is moved to Central India or Bengal; or it

arrives at Bombay, is despatched to the Punjaub, moves eventually to Peshawur, thence down to the North-west or Oudh, or perhaps to a hill station, and thence to Central India.

To give examples :—

1. The regiments named in the margin moved from Calcutta to a station in Oudh, thence to Allahabad, Agra, Meean Meer, and Peshawur, from Peshawur to the hills, and thence to Central India.

90th Light Infantry.
7th Fusiliers.
93rd Highlanders.

2. Again, others from Peshawur have moved to an intermediate station in the Punjaub, and then to Central India ; others from Central India to hill stations, then to Peshawur, and thence back again to Central India or Bengal.

52nd Regiment.
72nd Regiment.
Rifle Brigade.

Now it does not fall within my province to discuss the mooted point as to whether periodical displays of our strength are necessary to the conservation of our prestige in the native mind, nor to do more than point out, *en passant*, the enormous expense which must be caused by thus moving regiments from Dan to Beersheba.

I confine myself to the medical phase of the question, and proceed to enquire if there is any risk to health involved in the system of rotation sketched above ?

I think most Medical Officers, if canvassed, would reply that these moves, involving often abrupt changes of climate, were trying and not unfrequently injurious to the health of the regiments. But there is one point on which no doubt whatever exists. It is the fatal effects sure to follow from moving a corps from one malarious district to another. Regiments that have served in stations in Bengal, or in Allahabad, Agra, and Meean Meer, are unfit for service in the Peshawur valley, and are invariably prostrated by malarial influences there, from which I believe none ever recover during the remainder of their service in India, even after a residence of 12 or 18 months at a hill station ; and never, certainly, if sent to a station in the plains, where malarial influences are more marked than in others.

To send regiments tainted with, and not perfectly recovered from, malarial influences to another malarious district is, I repeat, a mistake, so far as the regiments are concerned, and sure to prove an expensive mistake to the State. It requires years to get rid of malarial taint ; and even when the constitution appears to have recovered, the least re-exposure to malarious influence will again produce disease. No man who has once suffered from ague in India ever *completely* shakes it off, until he quits India for a time.

Again, I consider it a mistake to send regiments that have served six or seven years in the plains direct to Peshawur, because the constitutions of the men, more or less exhausted, are unable to withstand the pernicious climate of the valley. Before proceeding to Peshawur, such regiments should, in my opinion pass two years in the hills, and after having completed their period of service in Peshawur should again be sent to the hills.

The 93rd was sent to Peshawur after six years' service in the plains, was there prostrated by epidemic cholera and ague, from which latter it did not recover for two years. In the beginning of 1867 it was sent to Jhansee and Sepree, and during last year ague again appeared in nearly all the men who had suffered from it in Peshawur and Sealkote.

Again, the 104th Regiment suffered much in 1865-6 from ague in the same stations. It proceeded to Dugshai in 1867, where cases of ague were frequent, and last cool season to Peshawur, where in the autumn it was struck by epidemic cholera, and suffered severely.

The whole plain of India is more or less malarial, but the stations marginally noted are decidedly the most unhealthy, as shown by the frequent, nay constant prevalence of cholera, remittent and intermittent fevers.

Bengal Proper, Jubbulpore, Jhansi, Seepree, Morar, Benares, Allahabad, Cawnpore, Agra, Meean Meer, Peshawur.

It may be laid down as an axiom, therefore, that no regiment should be sent from one malarial district *immediately* to another ; *a fortiori*, that no regiment which has suffered much in a malarious district be sent to another malarial district, even should it have been at an intermediate healthy station for one year or even eighteen months.

Without presuming to examine too critically the system of relief as it has obtained of late years, enough, it is believed, has been adduced to show that, so far as medical reasons go, it has not always been carried out in accordance with their dictates, as evolved by experience.

Whether, in the rotation of stations, any fixed plan has been, as a rule, pursued, or all has been haphazard, favour or caprice, I shall not undertake to say. Of late years I can aver that the sickly state of a regiment has been its surest passport to a healthy or a hill station, or a working party in the hills; but it does not appear that this principle has been always acted upon in the selection of corps for these envied locations.

NOTE.—Within the last 11 years, regiments are known to have been *twice* sent to hill stations; others have never been in a hill station at all.

The 101st has three times had the benefit of a hill station in 12 years.

The 104th twice in the same period.

Other regiments (7th, for example) have always been in so-called unhealthy stations.

In a word, the system, if system it can be called, does not seem, whatever military merits it may have had to recommend it, to have been that most consonant with sanitary considerations. Can a better be substituted?

With a view to solve this question, I had the statistics of sundry British regiments examined, their medical history carefully traced in connection with the several stations to which they successively passed, and had hoped to have evolved some data on which to base a sound system of relief or rotation; but the evidence, when collected and compared, proved so conflicting, on account of the very different conditions under which the regiments in question came to be reviewed *supra* previous and present state of health, length of service in India, &c., that the attempt was abandoned as impracticable.

The following, however, is a proposal which will obviate many of the difficulties connected with this subject, and if carried out will, I am sanguine enough to believe, be attended with great saving of life and money:—

1. I propose that all regiments coming to India should be sent to serve in particular provinces—the Punjab, N.W., Central India, Bengal—and that they should not leave these provinces, under ordinary circumstances, during their stay in India.

2. That each regiment should have a hill station in connection with the one in the plains, for which the Himalaya and Rajmahal range offer every facility in Bengal, while the Neilgherries, Mahabeleswar, and other hill sites are equally available for the requirements of Madras and Bombay respectively.

3. That, so far as practicable, a regiment on arrival in India should be sent to a hill station at a high altitude for two years, where it should hut itself, have no regimental establishment allowed except sweepers, and should do everything for itself as in England.

After two years' service in the hills, the regiment should be brought down to the plains, remain two years at the station of its appointed district, during which time the regular establishment of servants should be supplied to it. The next two years again should be passed in the hills, but at a lower altitude, and all servants, except sweepers, again withdrawn. The fourth period of two years should be spent on the plains; and the fifth period of two years (which should be the last in India) should be on the hills, but at a lower altitude; and from thence it might go direct to England at any season of the year.

In this way regiments would serve ten years in India, six of which would be in the hills, and four on the plains.

I am quite aware that this plan pre-supposes a re-distribution of the Army and an allotment to hill stations of a much larger proportion of the European force than obtains at present.

This is so vital a question as affecting the health of the Army in India generally, and involves so directly the feasibility of the scheme which I have proposed, that it seems desirable to consider it a little more in detail.

Supposing then that the troops were permitted to hut themselves in suitable localities in the hills, as suggested, the question comes up, could any and what numbers now in garrison in the plains be withdrawn therefrom without jeopardizing our hold on the country?

On this head I am aware Statesmen and Commanders of great Indian eminence differ, some maintaining that one-half of our force might safely be located in the hills, while others hold that any reduction of the present numbers in

garrison in the plains would be the signal for *emeutes* among the more turbulent population of India, to suppress which our troops would be constantly descending from the hills.

I am not aware to which side of this question the present Government inclines, but the fearful ravages of cholera during the past year embolden me to bring this subject under the consideration of Government as one, if not the most serious that can engage its attention. If the extension of railways to the foot of the hills, the formation of entrenched camps or forts at the larger stations in the plains, or other means and improvements which military men only are competent to deal with and devise, could accomplish the consummation desired, no time, I respectfully submit, should be lost in carrying these works into execution. All our efforts to stay the ravages of cholera have hitherto been fruitless. These ravages appear, on each successive outbreak, to be on the increase, both as to frequency and virulence; and, in the present state of our knowledge, our only safety consists in the withdrawal of as many of our troops as possible to hill stations. Here, although cholera is not unknown, it is an acknowledged fact that its visitations are comparatively infrequent, and its force shorn of much of its virulence. The present lamentable state of the 58th Regiment, and the recent fearful tragedy at Peshawur, call aloud, I respectfully submit, for inquiry into a policy which condemns so many victims to a premature death, with a view to the possibility of its modification or reversal. Public opinion, and the difficulty of keeping up a supply of recruits, will, if I mistake not, sooner or later force this whole subject on the attention of Parliament.

One further remark I would venture under the present head. It is during the first and second years of service in the plains of India that regiments are most sickly, and the mortality during these years is often greater than that during the whole of their remaining service in India, epidemic disease excepted. This is a very significant fact, and one which does not seem to have received that recognition which its importance demands. It points to the expediency of all newly-arrived regiments and drafts passing their two first years of service in the hills so far as is practicable, whatever be the system adopted with regard to their after movements.

Another point is deserving of a passing remark. Why should regiments sent to the hills not hut themselves instead of being accommodated in expensive permanent barracks, which are there quite out of place? I have reason to know that under proper engineer supervision they could perfectly well do so, and they should have nothing but *tentes d'abri* allowed them until they do so.

Apart from the saving to Government by utilizing soldier labour (the value of which is only now beginning to be recognized), the practice as a training for active service and as a source of recreation cannot be overrated. The employment of soldier labour, so conspicuously successful in road-making in the hills, falls yet far short of the point to which it should be carried.

Vide Horse Guards' recent Order.

To sum up. The following benefits appear derivable from the above proposals:—

Regiments would pass half their period of service in a comparatively good climate; invaliding would be reduced; mortality diminished; regiments would be kept in a more efficient condition, and the State saved enormous expense.

To march regiments from Peshawur to Saugor, from Sealkote to Jhansi, from Jhansi to Dugshai, and from Subathoo to Kamptee, must cost lacs of rupees.

Allotting regiments to provinces, and moving them only within this province, from hills to plains, and *vice versâ*, would save health, wealth, and life.

These remarks, it is hardly necessary to add, refer only to times of peace. Military must always override all sanitary considerations.

III. Do convalescent depôts pay? or, in other words, does the Government receive an equivalent for the expense of their maintenance?

Convalescent Depôts.

It is the opinion of some of the most experienced executive and administrative Medical Officers who have given attention to the subject, that the benefits accruing from these establishments are not equal to their expense.

With this verdict I am very much disposed to concur. Soldiers who once

go to a hill depôt frequently either have to be invalided from the depôt, or return the following year to the hills, or are invalided from their regiments. I have known men to be sent three years in succession to hill depôts (a practice which I have latterly taken steps to abate), and at last invalided to England. In truth, once a man goes as an invalid to a sanatorium, he is too apt to consider himself, and to be regarded by his comrades, as a confirmed valetudinarian, from whom "a good day's work for a good day's pay" is not henceforward to be expected; and so he eventually drifts to Netley. With the view of ascertaining what proportion of men who have passed a season at a hill depôt eventually become fit for duty in the plains, and remain so, I have lately circulated among Medical Officers a series of queries, but the replies which these have elicited are not so positive and comprehensive as to warrant reliable deductions being drawn from them. In fact, the statistics of hill depôts seem to have been kept up in a very loose and perfunctory manner—a practice which will not be so henceforward. These inquiries will be further prosecuted; and, if I find grounds sufficient to justify the steps, I will take the liberty of submitting to Government the expediency of doing away with these depôts, and appropriating the existing buildings to regiments or wings of regiments.

If my suggestion of sending regiments to hill stations every alternate two years were adopted, convalescent depôts would no longer be required; and thus, besides the saving in money and life by the rotation system of hill service, and restriction of regiments to provinces, there would be a further large saving effected by sending invalids at once to England, instead of in the first instance to hill depôts, to which a Commandant, Station Staff Officer, Serjeant-Majors, Quartermaster-Serjeants, &c. &c., are appointed and paid extra, to say nothing of the Medical Officers and Native hospital establishments, all of which might then be dispensed with. If a soldier required a change to the hills, he could have a furlough, or be attached for a time to a regiment serving there.

These hints are thrown out in the hope that the subject may attract the notice of Government, and perhaps call forth some decided action in order to determine the usefulness of these establishments or otherwise. In weighing the advantages to be anticipated from a residence in the hills, it should never be forgotten that the balance of medical opinion is *against* the hills as *curative* means or agencies. Their real value consists in *keeping men well* whose constitutions are yet unbroken.

The New Standard Barracks.

IV. A reaction, arising out of what it is the fashion to call the "financial crisis," has lately arisen against these permanent barracks, chiefly owing to their costly character, and their not having fulfilled all the expectations that were formed of them, which there is some risk of being carried beyond due limits, with the effect of undervaluing structures that are far superior to anything of the kind that has gone before them, and which must be regarded as an inestimable boon conferred on the British soldier doomed to service in the plains of India. That they are not perfect, that they are hot and in some respects uncomfortable, that less expensive structures would equally well have fulfilled the required conditions of a healthy barrack, are truths that cannot be gainsaid; but to aver, from what took place at Allahabad and Peshawur during the recent cholera epidemic, that they are no better, but worse, than the old-fashioned structures which they superseded, in regard to warding off the inroads of cholera, is not a fair statement, but a perversion of the facts; for, as regards Allahabad, it is well known that the men of the 58th Regiment were cholera-tainted before they entered them, and that the surroundings of the buildings, when taken into occupancy, were in anything but a satisfactory sanitary condition. The same exculpatory plea might easily be set up in regard to those at Peshawur if necessary. In fact, none of these barracks have yet been occupied sufficiently long to warrant a fair judgment being formed of them.

That the men should prefer the upper story, where they can lounge on their beds and smoke their pipes, to the recreation room, where they are confined to a narrow form as a seat, is intelligible enough to all who know the habits of soldiers in India. It was, however, undoubtedly a great mistake to adopt one uniform standard for conditions of locality and climate so varied and opposite as the cantonments in the plains and hills of India exhibit.

In the swampy malarial cantonments of Bengal Proper, two-storied buildings

were indispensable ; but in the drier climate and soil of the Punjab and Upper Provinces, the same amount of raising the occupants from the ground was not necessary, and a one-storied edifice elevated on a plinth four or five feet high would have answered every purpose, and saved a large part of the total outlay.

That these two-storied barracks have been found unexpectedly hot might have been almost predicted from their extensive wall-surface, height, nature of roof, and in some cases their position ; but happily some of these defects are remediable. The double or Jubbulpore roof must be supplied where wanted, and can be so, I understand, at small expense. The open verandahs, against which the sun beats, must be protected by large sunshades or jalousies ; and in the Punjab and all dry up-country stations, the lower story can be safely used as dormitories (the men dining in the verandahs), and thus much of the odium attaching to these structures will be done away with.

As to their erection, *pur et simple*, at hill stations, nothing can justify so wasteful an expenditure of public money ; such extravagance is simply sinful.

The decision which the Government will come to on a review of the whole subject will be, I trust, that no more of these expensive structures shall be built.

The kind of barrack that is wanted for the greater part of the plains, save Lower Bengal, is an inexpensive building of sun-dried bricks, with a sun-proof roof, and provided with the other necessary conditions of space, reasonable segregation, and efficient drainage. Such structures, in the event of any locality becoming frequently unhealthy, could be thrown down and erected elsewhere, the materials being used a second time.

One drawback to these standard barracks is that they tie us down to a locality which it may be found desirable on grounds of health to abandon.

On the whole, then, let us be thankful for these so-called "palatial residences." They will be a standing monument of the benevolence of the Government which called them into existence, and before many years, will amply repay, in the improved health of the British soldiery, the sums that have been expended upon them, even should these have been larger than what was absolutely required.

I have, &c.
W. M. Muir,
Inspector-General of Hospitals, and P.M.O., British Troops.

The Secretary to the Government of India, Military Department, Calcutta.

Remarks by Inspector-General Dr. Beatson, on Regimental Arrangements in India.

Query.

1. What should be the composition of one) of the mortality in regiments in India, particularly in regiments sent to regiments newly arrived in the country, has its origin in India, to avoid the the immature age at which many of the men are sent out losses consequent on to India.
allowing unsuitable men to go there ?

1. I believe that one cause (and not an inconsiderable

2. It is true that, at first sight, statistics do not appear to bear out the idea that the death rate is greater among this class than among those more advanced ; in fact mere figures seem to prove quite the contrary, that is, the percentage of deaths will at any time appear to be considerably increased during each quinquennial period of life.

3. If figures go to show this result, how can it be established that the mortality is really greater, although apparently less, among those who go to India as boys than it is among those who arrive in the country at a more mature age ? I think the fact which is generally believed

and accepted might probably be proved by figures in this way, viz., by carefully comparing the statistics according to age among men (up to 35) who have been the *same length of time in India*, for it is this latter element that, in my opinion goes considerably to swell the mortality with each advancing period in life.

4. Then, again, the larger proportion of lads under 20 may not have arrived in India till they were 19, and thus, although their health may suffer, they may not actually succumb during their first year of service, but during a subsequent one, and so increase the death rate from 20 to 25.

5. Of course I am quite well aware that in times gone by many (I do not think there are many now) entertained the idea that men become inured to the climate of India, and that the more complete the process of so-called acclimitization the more safe the life of the individual, and the more safely could such an individual undergo exposure and hard work in an Indian climate. *All statistics, however,* (analyze them as we will) *prove this to be a mistake, and clearly show that with advancing age, and it may be presumed, as a rule, with proportionally longer Indian service, the mortality among men, say from 30 to 40, is twice as great as among men from 20 to 25.*

6. Residence in the plains of India involves, and, in nine cases out of ten, is inseparable from, deterioration from the standard of health in the European constitution; and when I have heard, in disproof of this opinion, an allusion to the hale old European pensioners formerly located at different circles in the plains of India, I could not help asking myself the question, "How many dead men do each of these living ones represent?"

7. The above consideration is to my mind a complete answer to those who would urge the expediency of again reverting to a local European force for India; such a change would be a retrogression; in fact, an impracticable one, inasmuch as the circumstances of military service have of late years greatly changed, and are still changing, under the improved and improving conditions of enlistment, all of which improved conditions must be equally applied to every soldier of Her Majesty, whether he elects to serve Her Majesty in Her Indian possessions or elsewhere.

8. The first element of localization was the acceptance, on the part of the recruit, of the condition of *long* and *continuous* service in India; this element, however, is at once disturbed by the limitation of every man's period of enlistment (for the infantry) to ten years, to be, I doubt not, yet further considerably reduced, at all events as regards foreign service.

9. It is, therefore, useless to consider whether or not continued residence in India secures immunity from disease; but altogether apart from the theory of acclimatization, every one of Indian, or in fact of any tropical experience will, I think, allow that for the first year or two of service in the tropics, every man requires to be more careful of his mode of life, inasmuch as he is undoubtedly more susceptible during the above period to attacks of acute disease; on which account it is highly desirable that his constitution should be *fined* down from the robust plethora of English health in a climate which would produce this change, without at the same time causing deterioration of constitution.

10. This object could, I conceive, be easily attained if it were understood that in all ordinary circumstances, that is,

in all quiet times, every newly-arrived regiment should occupy for the first two years of its Indian service a hill station.

11. If this can be accomplished, and a rule enforced that no lads should leave England for India until they have completed at least their 20th year, I would feel hopeful that the mortality in newly-arrived regiments would be greatly diminished.

QUERY.

2. What arrangements could be made to ensure the arrival of troops in India at the proper season?

1. This second question is not very easily answered. If the question simply were, what is the proper season for troops, fresh from England, to arrive in India, an answer could easily enough be given; but to say *what arrangements can be made* to ensure the arrival of troops at proper seasons is a much longer question; in fact, all that can be said is, that it is entirely a question of the number of regiments and of details which have in any year to be sent to India, and the amount of the means of transport at command.

It may be safely said that it is most desirable on sanitary grounds that all the arrivals should take place before the 1st of January in each year; and to this it may unhesitatingly be replied, that with existing means of transport, and with the present number of men to be sent out annually, their being all in India before 1st January is simply an impossibility; for while it is desirable that all should arrive before the beginning of the year, it is equally desirable that none should go down the Red Sea before the middle of October.

2. Those conditions could of course be met by sending one half of the troops under orders for India *viâ* the Cape, leaving England the beginning of September; but independent of other considerations, this would of necessity largely increase the expense of the relief.

QUERY.

3. Also the departure of invalids from India, so as to ensure their arrival at the proper season in England? and their selection in the most favourable time in India? The present system is faulty on both heads.

1. My opinion is, that men who are to come home *viâ* Egypt should not as a rule arrrive in England before April; in other words, should not leave India before the middle of March, or anyhow not before the beginning of that month; and further that the Invaliding Committees in India should not sit before the end of December or early in January. It is an extremely difficult matter to get old-established rules and routine altered in India. These Invaliding Committees have sat for, I dare say, nearly half a century in October, and their assembling at that time is looked upon as one of the institutions of the country; but the India of the present day is not the India of fifty years ago, in fact is not the India of ten years ago, a fact which, willingly or unwillingly, must be accepted, and must always be kept in mind.

2. When October was the month fixed upon for the assembling of the Committees to examine and report on men brought forward for change of climate, the reasons for fixing on that month were good and valid ones. In the first place, after the men had been passed, all their papers military or medical, had to be prepared or completed (this of course has to be done still), and it might fairly be presumed that the preparation of these documents would occupy at least three, or perhaps four weeks. After the completion of their papers, the men had to be despatched by ordinary route marches, or by boats to the Presidency, where it was desirable to have them available for embarkation in all January, so that they might arrive in England about the end of April or the beginning of May.

3. How changed is all this now! And how much greater will the change be when the Grand Trunk Railway system, now rapidly advancing towards completion, is finished! No man will then be many days distance from port of embarkation, and the time which it will take to get him there can be calculated exactly. There can therefore be no objection if the invalid and weakly men, are not, as a rule, to be embarked till the beginning of March to not bringing them before Invaliding Committees till January. One thing is quite certain, and of this I am every day more convinced by my experience in invaliding men at Netley, that many men are sent home needlessly from India; not from any carelessness or neglect on the part of the Invaliding Committees, but simply from the fact that many men, worn down by the heat during the summer months, look so ill at the end of the hot season as to justify the belief that they really require a change. After three months of the cold season in the Punjab or N.W. Provinces, the same men would scarcely be recognized as the same individuals, but *they have been passed*, and *therefore* must go home.

4. The advisability of deferring the assembling of Invaliding Committees till January, was brought forward by Surgeon Furlong, 6th Dragoon Guards, through His Excellency Sir Robert Napier (now Lord Napier of Magdala), then Commanding-in-Chief at Bombay, in the summer of 1867; and when referred to me, I recommended the suggestion of Surgeon Furlong as well worthy of attention. I left India soon after, so I am not aware if any further consideration has been given to the subject.

5. Another painful fact has (during the past spring especially) been made evident at Netley, and that is, that many of the men invalided on account of tropical disease, especially dysentery, have had their symptoms greatly aggravated by the sudden change of temperature on this side of Egypt, and have suffered all the more on account of an insufficiency of warm, especially under-flannel, clothing, which all men who are at all weakly, in fact all invalids, should have issued out to them on embarking at Alexandria; this flannel under-clothing should invariably include drawers as well as a flannel Banian with sleeves.

5. It is almost needless to say that patients labouring under consumptive disease, or tendency thereto, have also suffered severely from the sudden changes of temperature; indeed the results were so serious among the invalids by a late ship (the "Crocodile"), and the deaths from pneumonia on board ship, at Netley, and in hospital at Portsmouth, were so numerous, that the subject was brought to the notice of the Director-General, Army Medical Department.

6. A man must be strong and sound to bear such sudden change and diminution of temperature as he must be subjected to, in leaving the mild weather of a tropical winter at Bombay to be in little less than a fortnight in the cold winter of more northern latitudes: indeed, considering that there is now a hospital establishment at Suez, my opinion is that the Invaliding Committees should distinctly report whether the invalid should proceed direct to England, or remain at Suez till the severe cold of spring is over.

7. It might be, however, advisable not to restrict the authorities in India from sending home early, by almost the first ships of the season, any men (especially if at a convenient distance from the port of embarkation) whom it might be considered would be likely to derive benefit from an early removal from India.

QUERY.

4. As no general plan at present exists for locating troops at suitable stations on their first arrival in India, and for a tour of duty thereafter, so as to render their service in the country as little hurtful as practicable, would it not be advisable specially to consider the subject, and to lay down some special practical plan to be carried out so far as the exigencies of the service admit of?

1. I have already, in some of the foregoing remarks, as well as on many previous occasions, in my official communications, while head of the Medical Department of Her Majesty's British Troops in India, answered this question; inasmuch as I have given my opinion that it will greatly conduce to the saving of health and life, as well as to the subsequent efficiency of the corps, if every regiment on arrival in India could spend the first two years of its service in the hills. To carry this out, however, several more hill stations would be required, over and above those which now exist, or are in course of formation.

2. At present the hill stations, *not* including the small depôt station at Dhuramsalla (Bhogsoo), at which accommodation could be provided for entire regiments, are as follows:—

1. Darjeeling.
2. Nynee Tal.
3. Landour (to be vacated as soon as Chuckratu, near Pokri, is fit for occupation).
4. Kussowlie.
5. Dugshai.
6. Subathoo.
7. Dalhousie (Baloon).
8. Murree.
9. Raneeket (not yet ready).

3. The latter is intended for a regiment, while at Chuckratu there will be accommodation for a regiment, and for a convalescent depôt. Dugshai and Sabathoo are also stations for regiments, and of late years there has been a wing of a regiment at Darjeeling; so that there will be four stations for regiments, and one, at which, for some years past a wing has been accommodated. The remaining hill stations now in occupation, viz., Nynee Tal, Kussowlie, Landour, Dalhousie, Murree, and the small one at Bhogsoo, have been for many years occupied by details of convalescents; in other words, have been convalescent depôts, although they might, all except Bhogsoo, be made suitable for occupation by entire regiments.

4. The question then arises, and may now be considered, in what way can hill stations be most *beneficially* utilized? a subject on which directly contrary opinions and views are entertained, as can easily be discovered by reference to the opinions officially expressed, and the recommendations founded on such opinions, which have been submitted to the authorities in India; my own opinion, and my recommendations while I was head of the Medical Department of Her Majesty's British Forces in India, being I may at once say, diametrically the opposite of the views entertained, and of the recommendations submitted to Government of India by the late Sanitary Commission for Bengal.

5. My disagreement in the views of that Commission arose from no feeling of jealousy or of hostility, but solely from my belief that the views entertained by the President and by a majority (not by all) of the members were altogether wrong; and further that these views were not supported by facts, nor by the reasons assigned for having arrived at the conclusions which (in what was in some respects an able, or at all events a well-written report) the Commission in the end of 1864 recommended the Government of India to accept as the basis for future arrangement in the matter of locating British soldiers in the hills.

6. A copy of that report is doubtless available to the War Office Sanitary Commission, the members of which can after perusal satisfy themselves whether or not I am in any way misrepresenting the opinions and recommendations of the Commission as embodied in their report. Of that report I have not myself a copy, so that I am speaking from my recollection of it, when (just five years ago) it was submitted to me for any remarks I had to make on the recommendations contained in it.

7. The report in question commenced with the enunciation of an opinion which is almost universally acknowledged to be a correct one; viz., that the hill climates of Northern India are more beneficial in the prevention than in the cure of tropical disease; and that an occasional sojourn in the hills is especially useful in warding off that general impairment of health almost invariably inseparable from lengthened residence in the plains of India. On this point the Commission and myself seemed to be quite agreed, while we differed altogether in the conclusions which we respectfully deduced from the above acknowledged fact; my conclusion being, that if hill climates are chiefly beneficial (as they certainly are) in *preventing* disease, then men who are well, or at all events who are *not ill*, should be regularly sent to the mountains, to keep them up to the standard of health. The recommendation of the Commission, on the other hand, was to the effect that neither healthy men nor entire regiments should ever be sent to the hills, but that a sort of composite battalion of all the weakly and sickly men, excluding of course all cases of marked organic disease, should be formed for location in the hills; that is, that as long as a man is able to do his duty, although his health may be deteriorating all the time, *until, in fact, the one year more makes him too succumb*, he is to be kept grinding in the heat of the plains; while the weakly, the sickly, and, let *me* add, the malingering and the lazy, are to have the enjoyment of a good climate and an easy life in the hills.

8. So far from my accepting the recommendation of the Sanitary Commission, that all the men sent to the hills should be selected cases of men whose health *was giving or had given way*, I would advocate quite a contrary arrangement, and would send periodically, and in their turn, entire regiments to hill stations, excluding merely the men who may be suffering from unmistakeable organic disease, all of whom had much better be at once invalided to England, as without such a change they are never likely to be really efficient soldiers in a tropical climate.

9. By thus giving men, *before they break down*, regular tours of the hills their health individually and as a regimental body may be, I conceive, greatly preserved, so as to enable them to get through their Indian tour of service with far less loss and inefficiency than at present take place.

10. What the tour of hill and plain service should be, as far as the *health* of regiments as a body is concerned, is a subject for mature consideration. My own opinion has always been that it should be *at least* two years in the hills for every four in the plains; this proportion of hill service I consider to be absolutely necessary; if it can be increased so much the better.

11. It is not for me to enter into the military or political aspect of the question of hill service for the British force in India, or to attempt to indicate what number of

men can be so located with due regard to military and political contingencies; but one broad fact seems patent, that unless the present strength of British troops in India is to be viewed merely as a *peace* establishment, it must be allowed that we have a sufficient force to secure all the really important strategic positions, to hold military command of all the great centres of population, and at the same time to enable us to assume offensive military operations, if necessary in the field. For this latter purpose one third, if not one half, of the British force would require to be available if need arose; and if it be so, why should not one third of the entire force in the country be in peaceful times available for location in the hills, at spots of sufficient elevation, but at the same time contiguous to the plains?

12. To carry out this system of relief, by which at least one-third of the force could be accommodated in the hills, and by which each regiment would spend two years in the hills after every four in the plains, it would be necessary to have one hill station to every three regiments on the establishment. This would probably involve about three more stations than now exist or are being formed in Bengal, provided the invalid depôt system is abandoned and all the stations at which convalescent depôts now are, be given over for regiments, and the accommodation at each completed up to the required extent.

13. At the several hill stations, if all are given over for regiments, there might be provided depôt accommodation for about 150 invalids at each, as from regiments in the plains there would probably be a limited number of men who would each year require temporary change to the hills. If, however, each regiment has its regular tour, *as a regiment*, of two years in the hills for every four in the plains, the number of men requiring change to the hills during their regimental tour of service in the plains should be much less than from regiments which often have, as at present, almost continuous service at hot and trying stations.

14. All the present convalescent depôt stations in the Punjab, except Bhogsoo, are quite well suited for the accommodation of entire regiments, provided the existing barrack accommodation were added to; although, as regards Kussowlie, and Dugshai also, the water supply, if not scanty, is very inconveniently situated, far down the hill. I have, however, always thought that a tank could be very easily formed, and a *large* body of water retained at the former station, if the deep gorge (through which all the water drainage is effected) were dammed across by an artificial bund.

I have heard it said, that considerable difficulty in retaining water in the gorge, even if a dam were built, would arise from the porous nature of the soil, but if *puddled* with clay, that difficulty would be obviated to a considerable extent, and the water thus collected, although not fit for drinking and cooking purposes, would be quite suitable for those of bathing and ablution, purposes for which the greater portion of the water consumption is needed; a facility of supply for these purposes is therefore a matter of great moment.

15. The question is often put, would it not be desirable to have a certain number of stations which would possess what may be called an intermediate temperature, and with a more moderate rainfall than we have, at an elevation of 7,000 feet, on the front or southern ranges of the Himalayas? The answer to this is, Yes, it would be *very desirable*

to have such stations, but where are we to find them in Northern India? I can only say that I have been a good deal over the front ranges of the Himalayas, and I have found no such localities, if we except Sabathoo, which is almost an exceptional feature in this part of the hills, forming as it were a flat tableland or hollow of limited extent, between the front or Kussowlie range and the second or Simla range of hills.

16. With regard to Sabathoo, a good deal of difference of opinion exists; by many the locality is thought to have all the disadvantages of the plains, with few of the advantages of the higher stations, especially as regards coolness. I do not agree in this opinion, for anyone who has come up direct from Umballa to Sabathoo must at once have felt the vast difference in temperature and in feelings experienced at the two places, the nights of Sabathoo being always comparatively cool, as may be expected at an elevation of 4,200 feet. Indeed, if Sabathoo were less surrounded by hills, and more of a plateau than a basin, its climate would be very enjoyable; and if more stations at the same elevation, and with equally convenient access to the plains, could be found, they would prove in many cases more beneficial to weakly regiments than localities 3,000 feet higher. Sabathoo itself has not hitherto (that is, in years gone by) had fair play, for when I first knew Sabathoo, even as late as 1863, most of the barracks were exceedingly bad; new ones and good ones have since sprung up, and I doubt not the place will prove a healthy locality.

17. Of course it may be said that in the interior of the Himalayas, in the Chini District for instance, all the evils of heavy rainfall may be avoided, and a climate delightful, while the front ranges of the Himalayas are drenched in rain and enveloped in fogs, may be enjoyed. All this is quite true, but it is equally true that locating troops far in the interior of the Himalayas is a simple impracticability. In fact, if suddenly wanted, it would be far easier to get a regiment from England than from Chini. Practically, therefore, we must consider our hill locations for British soldiers as entirely confined to the first or second range of hills, that is, not further in than Simla; and my belief is, that within that area there are ample sites to be found for any number of men that can be spared from the plains. All access into the far interior, that is beyond the Simla range, may be said to be cut off, and all communication to be next to impracticable during the six winter months.

18. Again, apart from the mountain ranges, there are few healthy elevated plateaus in Bengal or in Northern India; nothing corresponding, for instance, to the Mysore plateau or tableland in Madras, on which, at an elevation of about 3,000 feet, we have one of the most delightful climates in all India—a truly intermediate climate, never too cold, and seldom uncomfortably hot. A glance at a map of India will, however, explain why this should be, and how very exceptional is the position of the Mysore district, situated on a comparatively narrow part of the peninsula of Hindostan, and within the influence of both monsoons, having always, in fact, the advantage of a sea breeze. The only other locality which I know, having some of the advantages, but only some, of Mysore, is the elevated tableland of Seonee in Central India, nearly midway between Nagpore and Jubbulpore.

19. It may no doubt be possible to find some few localities—such, for instance, as Loohoghat, or Bukloh below

Dalhousie, on the southern aspect of the Himalayas—fit for occupation by British troops, at an elevation considerably below 7,000 feet; but another glance at the map of India, on which are shown the elevations of the several mountain ranges, will indicate how abruptly, as a rule, the mountains in Northern India rise on their southern aspect from the plains, with little or no intermediate rising ground between.

20. Further, I may add that where hills of lesser height intervene—as, for instance, the Sevalik range which encircles the southern side of the Deyhra Dhoon—such hills are not healthy, nor suited for occupation by British troops. Indeed many of the lower spurs, even on the northern side, below Mussouri and Landour, at elevations of from 4,000 to 5,000 feet, are not considered to be beyond the influence of malaria rising from the plain of the Dhoon below.

21. We may therefore, in considering the question of having troops in the plains, or of locating them at higher elevations, practically confine ourselves to the consideration of *hill* stations properly so called; that is, localities at elevations of from 6,000 to 7,000 feet above the sea—an elevation at which, even if overhanging the plains, as may be said to be the case with Kussowlie, there is little risk of any injurious influence from malaria from the plains below, although not complete immunity from winds more or less hot.

22. Unless, therefore, we can ascend to this elevation, or find localities of similar topographical character with Sabathoo or Loohoghat, we had better look for healthy localities in the plains than risk the location of men at so-called intermediate stations; that is, at elevations intermediate between that of the plains and of 7,000 feet.

[Dr. Beatson has devoted several paragraphs to the question of barrack construction, but as this point is not before the Commission, it is unnecessary to enter on it.]

42. Another important matter for the consideration of the War Office Commission, as closely connected with that of barrack accommodation, will be the recommendations they may see fit to make as to what should be the constitution of the force located on the hills. If the present system of invalid depôts—a system liable to great abuse, and of which we cannot say the results are, or have been, very satisfactory—be abolished, or at least greatly modified, a large amount of excellent barrack accommodation will at once be available in the hills, which, with moderate additions, would accommodate an entire regiment at each station now occupied by a depôt. The required addition to the accommodation at each station would be comparatively inexpensive, as it would consist merely of one or two barrack bungalows, there being already, at most of the depôt stations, *ample* hospital accommodation, *sufficient* married accommodation, and all the requirements of skittle alley, reading, recreation rooms, &c.

43. It would materially assist the drawing of satisfactory conclusions as to the real benefits that have been derived from the present system of hill depôts, if the results of residence there, on sickly and weakly men, can be traced; and there should be no difficulty in doing this, nor, from the information thus obtained, of ascertaining how many men were permanently benefited by a residence at a hill depôt during one hot season; and further, how many men, after one, two, or three seasons' residence in the hills, had after all to be sent to England. I myself believe that the information thus obtained would show that the present

system has not been a success. At all events there is little doubt on one point, that no small proportion of the invalids who arrive at Netley come from a hill depôt.

44. I will now observe, before concluding these remarks, that when I have spoken of locating regiments in the hills of Northern India, I am not at all an advocate for keeping the men, who will thus be in a cool and healthy climate, in idleness. On the contrary, I believe that the very best results of a hill climate will be obtained by utilizing (as has of late been done to a great and yearly increasing extent) the labour of the men in the making of roads, and in the building of their own barracks or huts—a consideration which at once raises the question, is it useful or expedient to tie men down to one particular spot by the erection of regular barrack buildings, or might it not be better to let them shift ground and rebuild fresh huts in the vicinity of any sphere of work which may be found for them? If this system were followed, regiments could return to the plains in the winter for military exercises.

45. Nothing can be more satisfactory or encouraging than the health statistics of the various working parties who have been employed in road-making along the line of approach to new stations, as for instance, on the Abbotabad road near Murree, and on the new line of road which is now being made from Donaira to Dalhousie. In every way the men have benefited, and so has the State; the work has been well done, and at a saving of expense; the health and physique of the men have improved, while their conduct has been excellent. It is in fact most encouraging to study the health statistics of these parties, to witness in the returns an almost entire exemption from those diseases which in the plains cause such loss of health and life, and to see a recorded death-rate of little more than at the rate of 4 per 1,000 per annum.

46. As to the men, by being so employed, suffering as soldiers—that is, as drilled machines—I think such a consideration is not worthy of a thought. A man, it is presumed, will be a drilled soldier before he is employed on road-making or other military works; and as he will be so employed only during the summer months, there will be the winter ones to devote to more purely military duties. In fact we have a proof in the state of the Royal Engineers, that a man may be an excellent workman, and be very constantly engaged at his trade, and be at the same time an intelligent, smart, and efficient soldier.

47. In the hot weather of 1863, the 101st Regiment, which had suffered severely in health at Mooltan, was stationed at Rawul Pindee, with a large number of men at work on the new Abbotabad road near Murree, when suddenly, and from such excellent training, they were summoned for active service in the Umbeyla Pass. There the men had to undergo great exposure, privation, and fatigue; but to all these they were fully equal. In fact the corps, during this difficult and severe service, not only sustained, but even added to the laurels of the justly renowned 1st Bengal Fusiliers.

V.—*Hill Stations.*

QUERY.

Should not arrangements be made for sending sickly men at once to the hills during the hot and rainy season?

This is the last query to be answered, and it is one which must be replied to with caution. Indeed I greatly doubt the expediency or the propriety of attempting to lay down anything approaching to fixed rules on the subject. I would much rather leave the decision entirely to the authorities on the spot, for *extreme caution* must be exer-

cised in the matter of moving sickly men even by railway in the hot weather in India; and when a man supposed to require change is at a station any way distant from the foot of the hills, such a move, if he did not die in transit, would probably remove all hope of his recovery.

From some other stations—Umballa, Roorkee, or Rawul Pindee for instance, or from the valley of Peshawur to Cherat—it might be possible, by a well-arranged system of transport, to give men even seriously ill the chance of benefiting by a move to the cooler climate of the hills; but in the wet weather, when, as a rule, men are suffering from acute disease of the liver or bowels, a sudden change to the cold and damp of a hill climate would be almost certain death. It is therefore out of the question for anyone not on the spot, and *weighing well* all the circumstances of each individual case—such as the state of the patient, the length of the journey, and consequent exposure involved in getting the sick men to the hills—to say whether or not removal in the hot weather would in any individual case be justifiable or not. As a *general practice*, it would certainly be neither desirable nor safe.

G. S. BEATSON, M.D.,
Inspector-General of Hospitals,
Principal Medical Officer.

Royal Victoria Hospital, Netley,
25th April, 1870.

APPENDIX No. IV.

ESSAY ON THE DRESS OF THE ARMY OF INDIA.

By Major and Brevet-Colonel Hon. E. C. H. Massey, 95th Regiment.

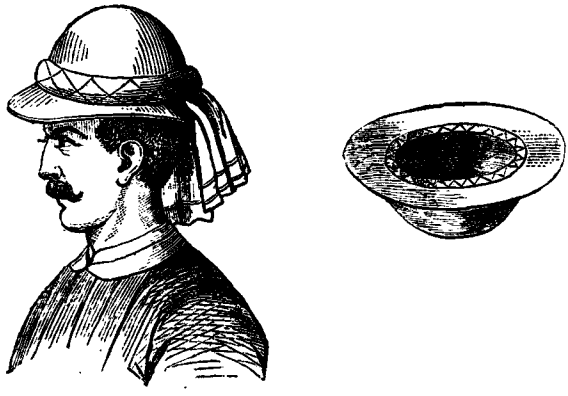
Poona, January 20, 1870.

The nature of my duties has rendered it impossible for me to strictly comply with the Standing Order respecting date of despatch to Meean Meer, so, as I have given myself some trouble in writing this treatise, should the Secretary decline to receive it, I would feel much obliged if he would kindly forward it to the Adjutant-General of the Indian Army, as I should like him to read it, being acquainted with the writer.

In consequence of the authorities having invited Officers to write an essay on the dress of all branches of the Indian Army, European and Native, I presume they are anxious to have this important subject thoroughly ventilated by those whose practical experience renders them capable of forming a sound opinion on this knotty and much vexed question; concerning which pseudo-reformers have at various times written so much sense and nonsense. Fearing that the remarks which I am about to make may be fated to be classified in the latter category, I address myself to the task with extreme diffidence, as I cannot help feeling that probably many better soldiers than myself are at present similarly engaged; so I shall commence by assuring those who kindly take the trouble of wading through the following pages, that my sole object in entering the arena in this discussion is, in the hope that some of my ideas may prove worthy of consideration, and I shall be perfectly satisfied if even one of the many suggestions I am about to make is eventually adopted, as I shall then have the pleasure of feeling that I have to this trifling extent, aided those who are endeavouring to promote the welfare of a noble service, in which I have passed the best years of my life. As I believe every one will admit that the Infantry is the backbone of the Army, I shall commence by discussing the dress of the foot soldier, and shall begin with his head-dress.

Head-dress.—I strongly disapprove of the present wicker helmet, issued to troops serving in India, for many reasons, some of which I shall now proceed to enumerate. It is most unnecessarily large, and projects so far over the eyes and nose that it materially interferes with a man's shooting, and I think this alone is sufficient to condemn it, as a head-dress in which a soldier cannot take accurate aim, is of course most undesirable. It is a most inefficient head-dress in wet weather, and the cane-work is an excellent hiding place for bugs, which swarm in most of the barracks of India. It is most uncomfortable to wear, and I do not consider it to be a very good protection against the sun. It is easily put out of shape, and is, even when new, extremely unsightly in appearance. I would suggest that a grey felt hat, of the stoutest description, of the shape of that depicted roughly in the margin, be substituted in lieu of the wicker helmet, as I conceive that it would be an immeasurably more comfortable and efficient head-dress, and would be equally suitable for all countries and seasons; for with the addition of

a wadded linen cover and large turban, I can assert from personal experience that it is rendered impervious to the vertical rays of the most powerful



tropical sun, as I never wore any other kind when out in pursuit of large game during the exceptionally hot weather we experienced last May and June. The hat I propose should be tolerably high in the crown, and should be ventilated on Ellwood's principle, as roughly sketched above.

Should the authorities consider that the back of a man's head, and his temples would not be sufficiently protected from the sun, when wearing a perfectly comfortable hat such as I have endeavoured to describe, I would,

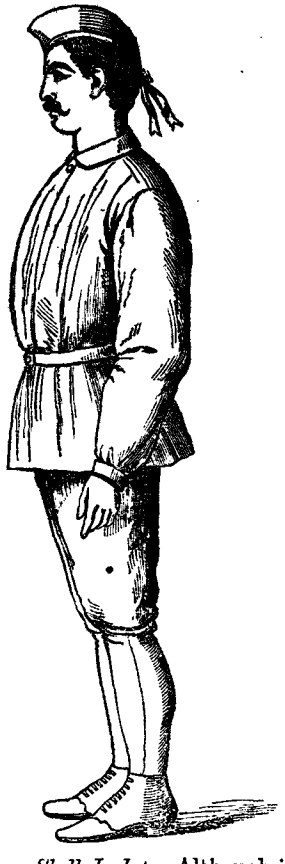
in that case, recommend that a strong grey felt helmet be adopted in lieu of the wicker one, and of such dimensions as not to interfere with a man's eyesight, which the present pattern certainly does, as any one will be able to testify who has seen troops wearing them when at ball practice. I think the shape of the cork helmet supplied by Hawkes and Co. is the best I have seen, as they are not nearly so clumsy as the wicker ones, and are soldier-like in appearance ; but, in my opinion, no helmet is as comfortable as a hat shaped like the one I have recommended for adoption.

Forage Caps.—As forage caps should only be worn by troops serving in India, either early in the morning or late in the afternoon, I think the Glengarry cap, which has, I believe, recently been decided on for the use of the Infantry, is as sensible a one as could be devised, as it is soldier-like in appearance, extremely comfortable, portable, and not likely to get out of shape; whereas the Kilmarnock cap, at present in wear, possesses none of these qualifications.

Tunic.—I disapprove entirely of the present tunic, as I consider it to be badly adapted for active service, either in Europe or India ; it is far too tight, and interferes seriously with the respiratory organs, as the throat and chest are far too confined.

Although I fully recognize the necessity of making the dress of the soldier as showy and attractive as possible, especially in an army raised by voluntary enlistments; nevertheless, as England maintains a standing Army for the purpose of upholding her honour in all parts of the world, and not for attracting the admiring gaze of her fair daughters when witnessing a mimic warfare at Aldershot, and such like places, when devising a suitable dress for the Army, perfect freedom to the limbs, comfort, and serviceableness should be the first considerations; and if it is impossible to hit upon a really handsome uniform possessing these essential qualities, which I am rather inclined to think will be the case, then the only business-like way that I can see of solving the difficulty is for the soldier to have two coats, one for show, and the other for work, and I think this might be managed without increasing the cost of clothing the Army to any great extent, as I shall endeavour subsequently to explain.

The Norfolk Jacket to be the Working Dress.—In my humble opinion the proper working dress for the British soldier would be a stout scarlet serge Norfolk jacket, with a small rolling collar, for I am a great advocate for having the neck left perfectly free from pressure, which is certainly not the case at present in any of the coats now in wear. For although the ridiculous leather stock no longer exists in the Army as a remnant of barbarism, nevertheless, until the present stand-up collar, fastened by a hook and eye of huge dimensions, is swept away, the necessary freedom will not be attained. Besides being uncomfortable, the stand-up collar is most uncleanly, as everyone who has had much to with soldiers must have frequently observed how often the inside of the collar of a soldier's tunic appears saturated with grease from perspiration, whereas a coat with a small rolling collar, such as I have endeavoured to sketch in the margin, would be free from all these objections; and as it would of course be most unsightly to see the neck band of a not over clean shirt protruding above the rolling collar, I would prevent such an exhibition by causing soldiers to supply themselves with two or three blue cotton moveable collars to fasten round the neck, as do the white ones most of us now wear when in plain clothes. The shape of a Norfolk jacket is so generally known, owing to its having now for some years held a high place in the estimation of sportsmen, as a dress admirably adapted for those whose pursuits demand great physical exertion, that I think it would be superfluous for me to give a minute description of it here; so suffice it to say that the Norfolk jacket should be the working dress of the Army; and I would suggest that a stout scarlet serge Norfolk jacket be issued annually to troops serving in India, in lieu of the cloth tunic, which is an unsuitable dress at any time or season for soldiers serving in any tropical climate.

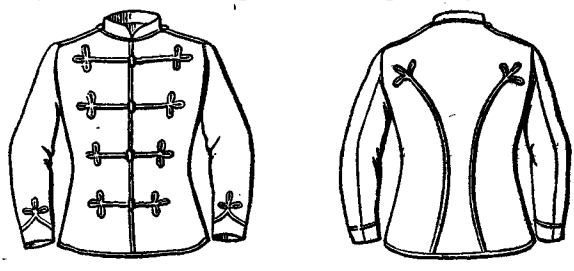


Shell Jacket.—Although it does not perhaps come within my province as an essayist on the most suitable dress for the Army in India to touch upon the shell jacket, as that ridiculous and thoroughly unserviceable garment does not form part of the kit of the Infantry soldier in this country; nevertheless as I am most anxious to see its abolition, as an article of dress for the British soldier when serving in other countries than India, I cannot refrain from embracing this opportunity of condemning it; as I think it must have struck most observing individuals, when they have met soldiers buttoned up

in tight shell jackets, when employed as working parties, or in carrying coal, or other fatigue duties, how singularly ill-adapted such a dress is for the purpose. I calculate that a soldier serving out of India could procure a scarlet serge Norfolk jacket, such as I propose should be issued to soldiers serving in India in lieu of the cloth tunic, for, if any thing, less money than he now pays for the shell jacket; therefore, if the cloth tunic, modified as I shall hereafter explain, was issued to him for show, he would not be put to greater expense than he is at present, should he be compelled to pay for the Norfolk jacket, as he would merely have to purchase it in lieu of the shell jacket.

Blue Woven Woollen Jersey Shirt.—I think that a blue woven woollen Jersey, such as is now worn by all sailors, should form part of the kit of British soldiers of all arms, as it is admirably adapted as a working dress for soldiers when performing any kind of fatigue duty, or recruit or setting-up drill in the barrack square, and would be equally well suited for men employed in throwing up field works; and it would prove a most economical dress, as a good woollen Jersey would last for years; and in cold weather the men could wear it underneath the Norfolk jacket. And should the Government demur at the expense which the gratuitous supply of this extra article biennially would necessitate, I do not think it would be any great hardship to the soldier should he be obliged to furnish himself with one at his own expense, as soldiers are now so much better paid than they used to be.

Full-dress Tunic not to be taken on Active Service.—If a soldier possessed a sailor's Jersey to wear when employed on fatigue duty or underneath the



Norfolk jacket in cold weather, it would obviate the necessity of his taking a tunic on active service, for, as I have before stated, I consider that the tunic should merely be worn when on home service, or when a regiment was employed on ordinary garrison duty in some non-tropical climate. As I may not have occasion to allude to the tunic again in the course of this treatise on the dress of the Army, I might as well here state that I consider a tunic cut somewhat the same as the blue patrol jacket now worn by the officers, would be far preferable to the present tight-waisted one; and in order to give it a showy appearance I would have it braided with yellow cord up the back and across the chest and fastened with hooks and eyes, and frogs, and olivets, instead of the present enormous-sized brass buttons.

White Clothing.—I strongly disapprove of the coarse American drill white clothing, for although cool in appearance, it is, in my opinion, by no means so in reality; for being of close texture, it only requires the addition of the congee water usually so liberally bestowed on it by the Dhobies (in lieu of starch) to render it almost impervious to air, to say nothing of the disadvantage of so many suits being required to enable a soldier to turn out on all parades and other occasions in a cleanly state. I would substitute in lieu of the four suits of white clothing which soldiers serving in India have now to keep up at their own expense, two suits of thin serge of the substance and quality of that in the margin;* as having worn clothes of that description myself, I can speak in the highest terms of its durability, and it is undoubtedly far cooler than white drill, for being of such open texture the air circulates freely through it, and when I have become heated I have never experienced the chills I have felt sometimes when wearing white clothing. As dark blue or

* The specimen of serge alluded to was attached to the manuscript Essay.

scarlet is considered to attract the rays of the sun more than a lighter colour, I would suggest light French grey as a suitable colour, if a fast dye of that colour is procurable; in fact, somewhat the same shade as that worn by the old Bombay Light Cavalry. The cut of the coats of this light serge should be the same as that of the scarlet serge, which I have proposed as the working dress, viz., a Norfolk jacket; and if the authorities considered that it required some embellishment, I would suggest a little red piping round the wristband, and small rolling collar, which would have a pleasing contrast with the bluish grey. The soldier serving in India would have to keep up two Norfolk jackets, and two pairs of trousers of this light serge, in lieu of the white clothing; and as I propose that soldiers serving in India should receive annually a scarlet serge Norfolk jacket, and no tunic, the difference in the soldier's favour between the cost of the latter and that of the former garment should be applied towards paying for the two serge suits, which I calculate a soldier would require annually, the balance requisite to cover the total cost of these two light serge suits to be stopped from his pay.

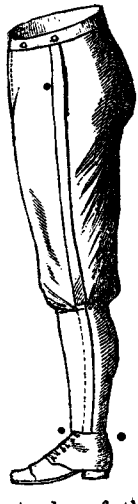
Waist-belts not to be worn off duty.—As a Norfolk jacket always sits close to the waist, owing to the band round it, I think the rule at present in force of compelling soldiers to wear the uncomfortable hard buff leather waistbelt might be rescinded with advantage, when soldiers are off parade or duty, as it would not only conduce immensely to their comfort, but would deprive them of an offensive weapon, with which serious injuries have often been inflicted by men engaged in drunken brawls.

Summary of the Alterations proposed in the Coats of the Infantry Soldier.—As I have written so long a paragraph on the coat question, perhaps it would be as well for me to here summarize the alterations I propose,—viz., the tunic to be cut like an officer's patrol jacket (which I am sure most of my brother officers will agree with me in saying is the most comfortable dress that has ever been devised for us, and it only requires a rolling collar, such as that worn by Engineer Officers, to render it perfect). The abolition of the shell jacket for soldiers serving at home, and the substitution of a stout scarlet serge Norfolk jacket, which should be served out annually to soldiers serving in India, instead of the tunic, which should not be worn by soldiers serving in a tropical climate.

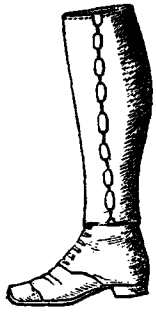
A sailor's woollen woven Jersey to form part of the kit of all soldiers.

Two suits of light-textured gray serge to be kept up by soldiers serving in India, in lieu of white clothing.

Black Cloth Trousers.—I consider the black cloth trousers to be the worst article at present issued to the British soldier; it is far too coarse in quality; the consequence is, that if a man wears them on a long march along a wet and muddy road, as soon as they get wet and dirty about the legs they are sure to drag, and will, in all probability, gall him about the thighs; in fact, I think that the black cloth trousers at present issued, are totally unfit for the Infantry soldier, whom I would supply with a modified knickerbocker, made of blue serge; that is to say, I would have the thighs made on the knickerbocker principle, only not quite so baggy as those usually worn by sportsmen; and from where the band below the knee is placed I would attach leggings of the same material; so the knickerbockers and leggings would form one garment, which I think would be desirable, as a soldier would be able to put them on more expeditiously than if they were separate; in fact, the trousers I propose is a species of pantaloon fitting perfectly loose about the thighs and knees, and tight from below the knee to the ankle; the legging portion to be fastened by small flat buttons concealed by a flap in the same way as the front of an ordinary trouser is secured. I think the soldier would require two pairs of these pantaloons, the second pair to be of the same coloured serge, of a lighter texture for summer wear.



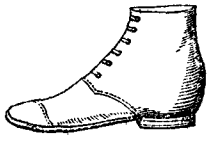
Leather Leggings.—I am sure that any man who has taken a walking tour, carrying his own knapsack, will bear me out in saying that a well-fitting legging is an immense support to the leg; and I think the leather one worn by the Zouaves and Voltigeurs of the French Army is as good a one as could be devised; therefore I think leather leggings of that description should be served out to our Infantry; and that they should be invariably worn over the pantaloons on the line of march, and on all occasions during wet or cold weather. I opine that any one who recollects what slovenly dirty fellows English soldiers looked in the Crimea, when returning from the trenches, with their wide-legged trousers begrimed with mud and filth up to their knees, cannot fail to endorse the opinions I have expressed as to the proper style of leg clothing for foot soldiers. The legging should be sufficiently long to cover the top of the boot, which all-important part of the soldier's equipment I shall now proceed to discuss.



When I first joined the Service, now more than 22 years ago, I think there is very little doubt but that the British Army was the worst booted in Europe, as little or no regard was paid to the proper fitting of the men's boots, and as they only received one pair of badly-shaped, ill-made, ammunition boots in the year, they were compelled to provide themselves with at least one other pair; and as in those days little or no attention was paid to these matters, the men frequently had in their possession high-heeled, narrow-toed boots, in which no man could march; the consequence was that whenever the men had a long march, numbers fell out foot-sore; and having read of the extraordinary marches occasionally performed by British soldiers in the Peninsula, I was somewhat astonished when, as a lad of 17½, I took my first march with a company of a distinguished corps (in fact, *nullis secundus*), to find that before we had proceeded 10 miles several of the men were sitting down by the side of the road, utterly incapacitated to continue the march owing to their ridiculous high-heeled dandified boots having blistered their feet.

Boots.—Although within the last few years the shape and quality of the ammunition boots have vastly improved, nevertheless I do not consider the present boot to be anything like as serviceable a one as might be adopted; for in the matter of boots, appearances should be banished from all consideration, as an Infantry soldier who cannot march is useless; and to enable him to do so, it is essential that he should wear the style of boots which gamekeepers and sportsmen have pronounced to be the best after long experience, so I should recommend that a leaf be taken out of their book *in re* of boots.

Being myself an enthusiastic sportsman, and a tolerably good pedestrian, I have no hesitation in condemning the ammunition boot, radiant from the joint effects of Day and Martin's blacking and elbow grease; and think it should give place to a broad and tunnelled-soled boot. I mean by that expression that the sole should project considerably beyond the uppers, the toes should be broad and capped, the heels should be low, broad, and long, the uppers should lace tolerably high up so as to ensure the legging well lapping over them, thus preventing gravel or sand getting down the boot, which is a frequent cause of men becoming foot-sore. I should not be in favour of too heavy a boot, therefore I would not stud the sole too thickly with nails; but I would recommend screws, slightly projecting above the surface of the sole, being placed as shown in the margin, as they would sufficiently protect the sole, and would prevent the men from slipping when marching along a greasy muddy road, the lower portion of the boot to be fastened with brass-bound eyelet holes, sufficiently large to admit of the strongest fishing-line boot laces, which is a material at least double as thick as the stoutest whipcord, and I have found it far more durable than leather, as the latter, unless made of the best porpoise hide, which is very hard to procure, are very apt to break. The upper portion of the boot might be fastened by hooks, as a boot secured in this manner is



much more quickly laced than when the lace for the whole length has to be passed through eyelet holes. Blacking and a polishing brush should not form part of the kit of the foot soldier, as his boots should be invariably kept well greased, as a man cannot march in hard boots. Before concluding the subject of boots, I would wish most strongly to urge the absolute necessity of more attention being insisted on, on the part of Regimental Quartermasters, Officers commanding companies, and their Pay Serjeants, respecting the proper fitting of the men's boots. Every man's foot in the regiment should be carefully measured annually by one of the Regimental Bootmakers, and the size carefully noted in a roll-book, so that the most accurate information could be supplied to the Quartermaster when making out his requisition for boots; as I think as much care as there ought to be is not bestowed on this most important matter at present, consequently it is by no means rare to see a soldier wearing badly-fitting boots. Any men with peculiar-shaped feet, whom it would be impossible to fit from the stock of different sized boots supplied by the Clothing Department, should have their boots made in the Regimental Workshop, which establishment should be supplied by Government with every description of last.

The long boots issued in the Crimea were absurdities for foot soldiers, as the men were utterly unable either to march or work in them. A good lace boot is the only description worthy of a moment's consideration for a foot soldier.

Great Coat.—I shall now discuss the Great Coat. I consider the one issued from the Clothing Department to be very inferior in quality to the light blue cloth great coats supplied by the Bombay Government. I have only seen one of the new pattern English great coats, and I certainly did not approve of it, as the cape was sewn down, which is most objectionable for India, as, being a bug-infested country, coats of this cut would speedily be well tenanted by those troublesome insects, as it would be impossible to clean a coat of this description. I think a cloth cape is a mistake for a soldier's great coat. I would merely have a rolling collar, which could be turned up in very bad weather, and I would have buttoned on to the coat a cloth hood similar to that worn in the French Army, as I have often noticed in the Crimea that French sentries looked far more comfortable in bad weather, with their hoods over their heads, than our men did with a useless cape blowing about. In lieu of the cloth cape I would supply each soldier with an oblong-shaped piece of tarpaulin or oiled light canvas, such as soldiers' great coats are made of; along the sides of which I would place eyelet holes, and I think it could then, by a little arrangement, be applied to the following purposes, viz.,—1st, as a cape to be worn in wet weather; 2nd, as a waterproof sheet for the soldier to lie on at night; 3rd, two or three fastened together might form a *tente d'abri*, such as the French use; 4th, on the line of march, his blanket and great coat might be rolled up in it in such a manner as, with the addition of slings on the yoke principle, to form a knapsack, as the following articles of kit could be placed in a small brown holland bag which would be packed in the waterproof together with the blanket and coat, thus keeping the whole of the soldier's kit perfectly dry, viz., one flannel shirt, one pair of woollen socks, one pair of pantaloons, one pair of boots, and one sailor's Jersey shirt, one towel, and a knife, fork, and spoon; and these articles, with the addition of the mess tin, which should be strapped to the slings, is the kit which I consider a soldier should carry on his back on service, as he should never be dependent on the agency of transport for a complete change of clothes; for although I have observed that some military writers suggest that the foot soldier should not be hampered with anything to carry except his rifle and ammunition, I cannot endorse such an utterly fallacious theory; and have always concluded that these impracticable suggestions must have emanated from men who had had no practical experience of actual warfare and were consequently advancing absurd theories on a subject which they were thoroughly incompetent to discuss. As all real soldiers know the difficulty of procuring a sufficient amount of transport for the conveyance of the spare ammunition, food and sick of an Army, therefore they would not be at all likely to advocate that the British Infantry soldier should henceforward have the kit conveyed for him, which he and every other foot soldier in Europe has, up to

the present time, carried on his back. I do not think it at all follows as a natural sequence that because the British soldier when buttoned up in a tight-fitting tunic, has proved himself unable to carry a most unnecessarily large kit, packed in the worst possible description of knapsack, that, when dressed in the workmanlike costume I propose, he should be unequal to carry the articles I have named, all of which I think must be pronounced essentially necessary to his health and comfort on a campaign.

Under Clothing.—As too much attention cannot possibly be bestowed on anything calculated to promote cleanliness in the British soldier, as the preservation of his health I feel convinced depends nearly as much on it as on his being properly clothed and fed, I am strongly in favour of a couple of pairs of cotton-web drawers forming part of the kit of British soldiers of all arms, as I think the present system of allowing them to wear trousers (of material incapable of being frequently washed) without drawers, is a mistake, and one likely to prove prejudicial to the health of the men, as very little consideration must suffice to convince the most sceptical on this point that with men of dirty habits their trousers must frequently be in an extremely filthy state. When soldiers were starting on a campaign in a cold climate they should be supplied with drawers of a woollen web.

Shirts and Socks.—The soldier on a campaign or when on the line of march should be compelled to wear a flannel shirt and woollen socks; therefore two of the former and two pair of the latter should invariably form a portion of his kit, so that he should at all times be prepared for either of these eventualties; but when in quarters I should recommend his being allowed to wear cotton shirts and socks, if he preferred so doing. I think I have now pretty well exhausted my ideas regarding the dress of the Infantry soldier, so I shall proceed to discuss that of the Dragoon.

British Cavalry.—Most of my remarks regarding head-dress, coats, and under clothing for Infantry are equally applicable to Cavalry soldiers, as I would likewise advocate their having a handsome tunic for show, and a good sensible working dress for service; and for the latter purpose I should say that there could be no better one than a short skirted stout serge Norfolk jacket; for although I do not pretend to be a sabreur, I think it stands to reason that a Dragoon could wield a sword with more effect when clothed in a perfectly loose dress than when buttoned up in a tight tunic. And it strikes me forcibly that if a plated or bronzed steel curb chain was placed, instead of shoulder straps, on the Norfolk jacket, that many a man would in action be protected from what otherwise might prove a fatal cut; but being a foot soldier I advance this opinion with all humility. I cannot think that the present leather-bound over-all can be as comfortable as a tolerably tight-fitting pantaloon, such as many of us wear in the hunting field, and I consider that a Hessian boot with a heel like an ordinary top-boot (viz., long and low) and hunting spurs, would be more business-like than the high-heeled Wellington boot with screw or box spur. The Cavalry man would of course require a light pair of ankle boots or shoes for wearing when at stables or employed on fatigue duties. But I cannot help thinking that the Hessian boot, or at any rate a boot somewhat of that description, is the most comfortable for the mounted man.

Artillery.—My remarks regarding the advantages likely to accrue from a loose dress being supplied to the Cavalry and Infantry soldier, applies with still greater force to the Artillery man, as the duties which he is frequently called upon to perform demand a greater amount of physical exertion. Therefore it is a matter of the first importance that his muscular action should not be impeded by his limbs being encased in tight clothes, and as the modifications necessary to render the costume I have proposed for the Infantry soldier applicable for the British gunner, is not likely to be well treated by me, I conceive that the subject had better be ventilated by an Officer belonging to that arm of the Service.

Dress of Native Troops, Cavalry.—I think that the loose Norfolk jacket and the pantaloons and Hessian boots and hunting spurs I have proposed for English Cavalry, would prove an equally suitable dress for the Native Cavalry; but there is no doubt that many of the Irregular regiments wear a very workman-like costume, and if any alterations are desirable, any of those gallant

men (who are at present commanding some of the Irregular corps), many of whom have gained a European reputation for their prowess as horsemen and swordsmen, are much better capable of discussing the requisite changes than I am, so I shall avoid a topic which I probably do not thoroughly understand.

Native Infantry.—There cannot be two opinions regarding its being an absurdity to dress men who, previous to their entering our Service, have been accustomed to wear the loose flowing robes of Asiatics, in tight tunics and trousers, and I think the sooner a more appropriate costume is adopted the better; however, as this is a question which one of our able Native Infantry Officers ought to be far better able to solve than myself, I shall merely confine myself to making a few general remarks, and if they are considered worthy of investigation the details can be worked out by an officer of that service.

Zouave Costume.—I think the dress worn by the French Zouaves would be a very sensible dress for our sepoys, as the fez would certainly suit them far better than the hideous ill-shapen forage cap they now usually wear, and with the addition of a turban would form an excellent head-dress, and the loose-fitting jacket and waistcoat, and the knickerbockers and leggings, would also be most suitable. However, should the Government consider that the adoption of the Zouave costume would be too expensive, then I would suggest that the Native Infantry should be clothed in the loose red serge Norfolk jacket and pantaloon-shaped knickerbockers which I have already recommended as the working dress for the British Infantry; and as it is equally necessary that the greatest attention should be paid to the fitting of the boots, the remarks I have already made on them will be equally applicable to sepoy troops.

Concluding Observations.—In conclusion, I shall now make a few general remarks, although perhaps some of them may not be considered to come strictly within my province as an essayist on the most suitable costume for the soldiers of all arms and nationalities serving in India.

Officers' Dress.—In these days of accurate-shooting rifles, it is, every one will admit, a matter of the greatest importance that the dress of the Officers should be assimilated as much as possible to that of the men when on service; therefore I think the sooner the useless crimson sash is abolished the better, as it renders an officer most conspicuous in the ranks, and no one who has not worn it can conceive how much it adds to one's discomfort in India, as it is extremely warm, to say nothing of its being by no means a cheap appendage. The Company Officers should be dressed when in action or on field days, &c., in scarlet serge Norfolk jackets, knickerbockers, leggings, and boots, the same as the men in cut. And, as on the rolling collar, the present system of distinguishing the different grades by crowns and stars could not well be continued, which is so much the better, as it is a most inefficient one, I should suggest that the French system of distinguishing the grades by rows of gold tracing braid on the arm be adopted, without any modification whatsoever, as nothing better could be devised, as the rank of an officer is recognized in an instant, whereas the last effort in tailoring in the British Army regarding the sleeve of the tunic, has not been equally successful.

Mounted Infantry Officers.—As the knickerbocker and leggings would not be suitable for mounted Officers, I think a pantaloon and Hessian boot should be adopted for them, the same as I have proposed for the Cavalry.

Officers' Full-dress Uniform.—I should advocate the Officers having a handsome full-dress tunic, the same as what I have proposed for the men in cut, and with gold cord, which would prove a far neater uniform than the present tunic, with that most useless gold and crimson sash. On ordinary parades, and when on orderly or court-martial duty, or when stationed in a garrison town, where it was compulsory for Officers to appear in uniform, I would suggest that permission might be accorded to them to wear the blue patrol jacket and trousers, similar to those we have at present.

Steel Scabbards.—I have perceived that some writers abuse the present steel sword scabbards, but in my opinion it is a decided improvement, being far more soldier-like in appearance and efficient for service, as what an Infantry Officer requires is a sharp point to his sword, as no man on foot, I think most swordsmen will admit, should think of cutting. I think those who are loud in praise of the useless old leather scabbards cannot have been

in the Crimea, otherwise they could not have failed to observe that a vast number, if not the majority, of Infantry Officers had lost the brass tips off their scabbards, and many of them had swords minus scabbards, the leather ones having become perfectly rotten from constant exposure to wet. If the authorities consider that the glittering steel scabbard makes Officers conspicuous in the ranks, that is very easily modified by having them browned like the barrel of a rifle before going on active service, and I trust they will never think of reverting to the useless old leather scabbards. I think a steel hilt, such as is worn by the Guards, should be substituted for the brass hilt on the Infantry sword, as the latter is a most inefficient protection for the hand, as a native armed with a sharp tulwar would cut through it with the greatest ease.

Shell Jacket.—I should advocate that the shell jacket be preserved as a mess dress for Officers, as it is a comfortable and at the same time economical one.

Pipe Clay and Soldiers' Belts.—Pipe clay is most objectionable for many reasons, and its use should be discontinued, as, in my opinion, the coarse buff leather belts should give place to bridle leather ones, which would be quite as strong, far more comfortable, and less liable to stretch.

Ammunition.—With regard to ammunition, I am inclined to think that the proper way of carrying it would be in *two rows* round the waist, in a belt somewhat of the description used by *sportsmen for their* breech-loaders; this belt should be supported by straps over the shoulders, like braces, to prevent undue pressure on the waist and loins.

APPENDIX No. V.

ESSAY ON THE DRESS OF THE BRITISH ARMY IN INDIA, EUROPEAN AND NATIVE.

By Assistant-Surgeon L. Corban, M.D., 21st Hussars.

"The dress of the British Army in India, European and Native," is a subject of great importance and interest in many points, as on it depends in a great degree the health, efficiency, and comfort of our soldiers. This subject has attracted the attention of many able men from time to time, who have written at length on it; and who have been the means of introducing many reforms and improvements. It is therefore difficult to avoid travelling in their footsteps. Nor can it be doubted that to enlarge on their views and maxims will be partly the best plan for carrying out improvements in the clothing of our troops.

The subject may be conveniently divided into two great sections, viz., 1st, the dress of the European troops; 2nd, the dress of the Native Army.

Section First.

The Dress of the European Troops.

The great objects of a soldier's clothing in India are protection against warmth and against cold and wet; the minor considerations have reference to comfort in fit and appearance on parade.

Thus two important points arise for discussion,—namely, 1st. The materials of clothing. 2nd. The make of the several articles of dress.

1st. The materials of a soldier's clothing in India are—(*a*) cotton, (*b*) wool, (*c*) leather.

The advantages of garments made of cotton are cheapness and durability. The disadvantages are—1st, it is a great conductor of heat; 2nd, it is a bad absorber of moisture. Its cheapness and durability make it a most suitable material for the garments of our troops in India. Hence we find it worn during the day by all our troops in India in the hot months, and generally after the rains; in the cold weather woollen clothing is worn day and night by the troops.

Cotton, by its toughness and strength of texture, is peculiarly suitable to Indian usages, remarkable among which may be mentioned the mode of washing and the constant washing to which white clothing is subjected.

It is universally acknowledged that it is injurious to wear cotton shirts next the skin, as cotton conducts heat so rapidly and absorbs so little water of perspiration that it is likely to produce chills after any exertion, and thus cause liver diseases, bowel affections, and fevers.

Wool, by its properties of slow conducting power and free absorption of perspiration, is *par excellence* the material for under clothing in India at all seasons by day and night. The property of "hygroscopic absorption," the manner in which water penetrates the individual wool fibres and distends them, is the one which enhances the value of wool for clothing purposes.

During exertion the evaporation of perspiration from the surface of the skin acts as one of the great cooling powers of the body, and when the exertion is over this vapour from the skin is condensed in the wool and returns to the body the great amount of heat rendered latent when the water was vapourized; thus chills are kept off, and a pleasant warmth is felt, contrasting favourably with the dangerous and uncomfortable cold wet feel of a linen or cotton shirt.

Woollen under-clothing keeps the skin in a state of hygienic moisture, and from its bad conducting power is warmer than cotton or linen, and a better protection against cold winds. The great disadvantage of woollen clothing is the way in which it shrinks after repeated washings, and when a woollen garment gets old it loses a great deal of its heating properties and becomes hard and thin.

Leather, as it enters into the formation of boots only in India, demands a short description. It is generally of excellent quality now, and the boots for the troops are made up at home. When the question of the make of garments comes to be discussed, boots will meet with a proper share of attention.

As in India the great object of clothing is protection against heat as regards European and against cold in the case of Native troops, it will be sufficient to describe the properties of cotton and wool when made into garments. To protect the body from the direct rays of the sun, the colour and not the texture is the important element. Of all colours white is the best; next in the order of merit comes grey, then yellow, pink, blue, black; therefore it is manifest why white American drill has been adopted as the dress of Europeans during the greater part of the year, and of Native soldiers in the hot-weather months.

It is, however, to be remarked that in the shade we estimate the qualities of a garment as to its heat-giving powers by its texture, thickness, and its conducting power, and not by its colour. The thicker a garment and the lower its conducting power, the hotter it is. Leather is the next hottest material for clothing after wool; it does not let any wind blow through it, and keeps in a good deal of perspiration. India-rubber is the hottest material of clothing, as it entirely prevents any perspiration evaporating from the surface and hinders the entrance of cold wind.

Wool possesses the properties in addition of being the best absorber of perspiration and odours, and if the garment is black, it will absorb odours better than one of any other colour, the order of merit being black, blue, red, green, yellow, white.

It is a disputed point as to whether flannel under-clothing is a protection or not against malaria. I am inclined to think it is, as it has been stated by some that soldiers who wear flannel shirts suffer less from fever than those who wear cotton ones. Combe asserts that at Rome wearing flannel under-clothing has some effect in lessening the risk of malaria. On the West Coast of Africa wearing flannel under-clothing has been tried with good effect, not only as regards malaria, but as touching other diseases. It is therefore to be strongly recommended in India for the same purpose.

The Make of Garments.—The variety of garments worn by the troops in India is great. The European soldier has a multiplicity of articles in his kit, which may be considered under the heads of (*a*) under-clothing and (*b*) outer clothing.

Under the heading of inside clothing the most important things to be considered are shirts and socks. Drawers are only worn by a few, it would however be a great improvement if they were worn by all European soldiers whenever they wear black cloth trousers.

Cleanliness and comfort would thereby be greatly promoted, as the accumulated perspiration and cutaneous exhalations in a black cloth trousers, never washed, makes the garment a suitable abode for vermin, and perhaps cause skin diseases. Drawers form no part of a soldier's kit, but it would be a vast improvement if a couple of pairs of thin cotton drawers were kept up by each man, and the cost to him would be trifling.

Shirts are the most important part of a soldier's under-clothing, and there are two kinds of shirts in use in the Army, flannel and cotton. Each European soldier is required to have in his kit either two flannel or three cotton shirts. At home most men keep cotton shirts, but in India, where they have more money at their disposal, flannel shirts are preferred generally. The men like cotton shirts for their cheapness and durability, but unless a flannel vest or Jersey is worn inside the shirt next the skin, a cotton shirt is unsuitable for wear in India. These flannel vests may be had at the Quartermaster's stores for Rs. 1·14 each, and when worn under a calico shirt a man may be said to be suitably under-clothed.

As regards flannel shirts they are theoretically the best under-clothing for the reasons stated in the beginning of this essay; there are however some important practical objections to their use in the Army; for instance, they require more constant washing than cotton shirts, and they are apt to shrink and become hard from constant washing; this shrinking is most apparent about the collar and sleeves, preventing these parts from being buttoned, and so making the shirt uncomfortable.

Moreover, it is probable that in time of war scarcity of water would render the washing of flannel shirts a matter of difficulty; but this objection would equally apply to shirts of any material, and a flannel shirt may be rendered partially clean by Parkes's plan, namely, exposing the shirt to the sun, beating it, and shaking it, and then wearing it day about with the other flannel shirt, as each man is supposed to have two in his kit. By this plan much dirt and many vermin are got rid of.

On active service none but flannel shirts should be worn by European soldiers, and I might suggest as an improvement that all flannel before being made up into shirts for the Army should be well shrunken, by steeping in hot water for one hour, and then slowly dried by evaporation; hanging in the air will do; it should not be squeezed; this process is then to be repeated with cold water.

I have tried this plan with success, and strongly recommend it. Another plan is to have the collars made of strong linen of the same colour as the shirt, and at the same time the wristbands or cuffs might be of the same material, with a tuck in the sleeve to be let out when necessary. By adopting any of these plans the present regulation grey flannel would make a capital shirt.

An objection to the present flannel shirts has been made, namely, that they are too hot and irritating for India, where boils and prickly-heat prevail: there is no doubt some force in this objection, and the plan recommended by Dr. Parkes might be tried, viz., mixing about 30 per cent. of cotton with the wool; this would make the shirt much cooler, and would almost prevent shrinking from constant washing.

Socks.—Woollen socks are issued to the soldier from the Quartermaster's store; a mixture of equal parts of cotton and wool would be better: it would be a good plan if all socks were well shrunken before being tried on. Each European soldier has three pair of socks in his kit.

Outer Clothing.—The outer clothing worn by the troops varies according to the several branches of the service and the season of the year. European Cavalry and Artillery wear their English tunics or stable jackets during the monsoon and cold weather months generally, and in the hot weather a white jacket of American drill. Trousers of a colour and material the same as the coat are worn at the same time.

That a thick English cloth tunic or stable jacket is an unsuitable dress for Europeans in India is a notorious fact, and a change has been frequently recommended. It would certainly be a boon to Cavalry and Artillery soldiers to have a loose comfortable blue serge patrol jacket of somewhat the same pattern as that worn by the Infantry, in place of their present tight uncomfortable tunics and stable jackets. Their duties in the stables and gun sheds are much more arduous than those of the Infantry soldier, whose work is almost nil. The shell jacket is not suitable for India, and is not generally worn. Colonel Bray, 4th Foot, has devised a waistcoat with sleeves; it is meant to be worn inside the red serge, and it would be particularly valuable to troops stationed on the hills or in cold stations in the north of India.

The red serge worn by British Infantry is a capital dress for India, or any country occupied by our troops, Canada excepted. It has been adopted for the Army serving at home under the name of the Norfolk jacket. The only improvement I could suggest in it would be that it should have four eyes on each side of the back seam on the inside of the coat, extending from the collar 12 inches down the back; the eyes on opposite sides to be 3 inches apart. To these eyes a flat pad made of linen or can as and containing cotton wool could be hooked on; this pad would be 12 inches long by 3 wide; it would lie on the back-bone, and being inside the coat would be unseen and form a perfect covering to the spine in the hot season. It is a

well-known fact that the sun has a very powerful effect on the spinal cord, and that this delicate organ requires protection from the direct rays of the sun. This pad would be 1 inch thick, and lying along between the shoulder-blades inside the coat would defy detection and thus be no eye-sore.

I have taken this idea from the dress worn by Shikarries and others travelling in the jungle in the hot weather. I have latterly worn this pad on my own shikar coat, and have experienced the greatest comfort from it in the hot weather. In all Indian stations in the hot weather it would be a cheap, simple, and I believe a valuable contrivance against sun-stroke; its price would not be more than a couple of annas, and by having two of them, a soldier could have one on his red serge and the other for his white coat; the eyes on the latter should be made of thread so as not to iron-mould the coat in washing.

The white American drill makes a capital coat, and is worn by all European troops in the day time, that is, from 9 A.M. to 5 P.M., in *most* stations nearly all the year round; in the hot weather it is worn by sentries at night. It would be an improvement if both the serge and white coats had pockets on the inside made of some strong material; these pockets might be placed two in front in the skirts and two on the sides: being inside they would be unseen, and be a great convenience to a soldier on a campaign.

Trousers.—Two kinds are worn by Europeans, white American drill for the hot, and black cloth for the cold weather months.

These pairs of trousers need no description; they are of good quality, a proper make, and suitable to the seasons. With the black cloth trousers, thin cotton drawers should invariably be worn for the sake of cleanliness, as before mentioned.

Like many other things, it took a number of years before the present comfortable trousers were issued to the Army, the soldier having first had to pass through the ordeal of breeches and gaiters, contemporary tortures with the black leather stock and tight coatee.

The most perfect trousers for a soldier is the peg-top pattern, loose over the hips and knees, and tight about the ankle; the latter a most useful safeguard against thorns, &c., to troops marching through the jungle.

Boots.—Of all the articles of a soldier's kit none are more essential to his comfort and efficiency than a good pair of boots (Duke of Wellington). The boots now issued to Europeans are an excellent ankle boot to the Infantry, and short Wellingtons to the mounted corps. The ankle boots lace up the front; they are large and comfortable, with good wide heels and soles, and they do not compress the foot or cause the toes to over-ride; they are well suited for marching and campaigning. The fact of having a low and wide heel and sole is of immense advantage, as there is a good base to support the centre of gravity of the body, the line of which runs down through the middle of the heel; thus the greater part of the weight is borne by the strong heel-bones, as nature intended it should be, and the weight is not thrown forward on the toes.

Great care is taken at Pimlico in the manufacture of soldier's boots; the leather, stitching, and size are all tested; a certain number of boots in each lot are cut up and examined, and if the quality of the leather is inferior, or the number of stitches in an inch less than the standard laid down, the whole lot from which these boots were taken is condemned.

Mr. Dowie, a bootmaker in the Strand, London, has introduced a boot with an elastic instead of a rigid waist; the waist is the part connecting the heel with the sole; there is thus very little muscular effort required in bending the waist. As a military boot they have never been extensively tried, as they are rather more expensive than the ordinary boot.

"The Hythe Boot," introduced by Colonel Carter, is on the same principle, namely, to lessen the rigidity of the sole of the boot; his plan is to have a slit across the tread. On the whole it is very doubtful if any of these boots are better for soldiers than the one now in use, and as there are at present 32 sizes of boots, 8 in length and 4 in breadth, it must be a very extraordinary shaped foot indeed that cannot be fitted.

Mr. Dowie has written a book on the subject, and he states that at the

battle of Maida, the Highlanders when ordered to charge had to stop and pull off their boots before they rushed at the French.

The Hussar boot and breeches are a more useful and serviceable dress for Cavalry than the present trousers: they are also more comfortable and easier to ride in. Boots can be made waterproof in the following way:—"Take half a "pound of shoemakers' dubbing, half a pint of linseed oil, half a pint of "solution of indiarubber (price 2*s.* per gallon), dissolve with gentle heat (it is "very inflammable), and rub on the boots. This will last for five or six "months." (Parkes.)

The Great Coat.—This has been called the most important article of a soldier's kit by many authorities, from the Duke of Wellington downwards.

The one at present issued to European soldiers is of an excellent quality; it only wants a hood to go over and protect the head when the soldier is campaigning, and a couple of pockets, to make it perfect. A short description of the coat will suffice; it is made of stout blue cloth with red piping, it is double-breasted, and a comfortable length.

In Scinde and Northern Indian stations, where extremes of temperature occur in the cold weather season, sheepskin coats are worn by European Officers, and are a most perfect protection from piercing cold. In the Punjab and the northern hill stations, where water freezes, a coat of this description ought to be issued to European sentries at night, and it would be the means I believe of lessening lung and bowel affections so prevalent in some of these localities.

A cloak is worn by European Cavalry and Artillery; it is larger than the Infantry great coat; the cape unbuttons and can be worn separately; when riding, the cloak covers a considerable portion of the horse as well as the man.

Head-dress.—Helmets and forage caps of different patterns are worn by European troops in India; the Cavalry and Artillery are much better off in this respect than the Infantry. The helmets of the former are made of leather, with an inside chamber all around to allow the circulation of air; the outside of the helmet is kept white and shining by pipeclay, and a white cotton puggree is worn around the helmet. This is a capital head-dress, it looks well and smart, and is a good protection to the head; a double iron hoop crossing at the top would give it increased strength to resist sword cuts.

In the Infantry a wicker work helmet is worn. The one now issued is a smart looking head-dress; it is very light, and for the cold weather months is a sufficient protection to the head. It has however many disadvantages; for instance, it does not cover sufficiently the back of the head and upper part of the neck, and thus these parts are exposed to the sun. The material of which the helmet is composed is not suitable or sufficient to protect the head from the heat of the sun; something thicker and denser than wicker work is required, and this I believe would be found either in leather or hard felt; the shape should correspond with the one worn by the Artillery. This could be easily kept white and shining by pipeclay, thus having the double advantage of reflecting the light and heat, and doing away with the necessity of keeping topee covers and the trouble of putting them on. I am convinced that the head would be much cooler under a topee of this kind than under the present thin wicker work one, and the head would be safer from a sword cut than it is now. The helmet should have the double iron hoop as before described.

It is a notorious fact that the wicker work helmet harbours bugs in great numbers sometimes, and when once they have taken possession of a topee, it is next to impossible to expel them. These filthy insects have a fine field for their operations when a man is drilling with his helmet on; they then travel undisturbed, consequently when the word "stand easy" is given, it is most suggestive to see the number of men who take their helmets off to disperse their tormentors.

As a decoration, a plume of the same shape and material as the Light Infantry plume might be worn on the helmet, where the present unsightly round knob projects. The plume might be the colour of the facings, the staff of the plume should not project more than about 2½ inches from the topee, with a slight inclination forwards; the plume would then hang back over the topee and would be ornamental.

In the dress worn by European Infantry the facings are not shown; a plume of the regimental colour would show at once the facings of the

regiment; it would make the men look taller, and would give the helmet a nice finish, making it an ornamental, martial-looking head-dress. The appearance of a regiment in line would by it be greatly improved. The plume could be easily taken out during the process of pipeclaying the helmet.

Light Infantry and Fusileer regiments could have their distinctive marks in the plume. Various kinds of helmets have been proposed by different authors, Jeffreys, Miller, &c. The principle of all appears to be reflection of the solar rays by means of a bright metallic surface; the idea is theoretically correct, but it cannot be reduced to practice; 1st, because brass or steel helmets should never be worn in India, owing to the conducting power of these metals; 2nd, the expense of covering ordinary leather helmets with a bright matallic surface would be very great, as aluminium is the only metal light enough for a coating, and this is much too costly to be applicable to the purpose.

Forage Caps.—The old forage cap will soon be replaced in the Infantry by the Glengarry cap. This has been issued to some regiments at home, and it is to be hoped it will be brought generally into use, as no better undress cap could be possibly found, being soldier-like by day, and it forms at night a comfortable nightcap, an important matter on active service.

The Cavalry and Artillery forage caps are smart and soldier-like; no change need be made in them.

Dress of Officers.—Before going into a description of the dress of the Native Army, it may be advisable to make a few remarks on Officers' uniform in India.

Cavalry and Artillery Officers wear during a part of the monsoon and cold-weather months the same thick cloth tunics and patrol jackets as the men. The tunic is only worn on a few parades, but it would be a great boon to Officers and to the men if the loose blue serge jacket, of the same shape as the Infantry, took the place of the tunic and stable jacket in India. This serge jacket has been before described, and could be easily made ornamental enough for these branches of the Service; however, it is to be remarked that gold lace or braid easily tarnishes from the heat, and when tarnished looks badly, therefore the less of it worn in India the better.

In the Infantry, Officers dress in the same pattern coat as the men,—red serge or white drill, according to the season.

Dress of the Native Army.

This important division of the subject will require a somewhat lengthened description, as there is no doubt whatever but that our native soldiers are both insufficiently and improperly clad. To begin with the Cavalry:—

In the Madras and Bombay regiments the turban is too small, it affords no protection from the sun or sword. Bengal Cavalry are infinitely better off in this respect, as in many others, than their fellow-soldiers in the other presidencies. The Central India Horse have a fine handsome-looking turban, which contrasts favourably with that of the Bombay Light Cavalry. Each sowar ought to be furnished with a "kaun topee" for night pickets and escort duty, &c.; this would protect his head and ears, and it is a notorious fact that natives are peculiarly sensitive as regards these parts, as may be inferred from the way in which they muffle their heads up.

The body clothing of the sowars is suitable enough. The coat wants a collar to fasten with hooks. This would improve the appearance of the coat and afford some protection to the neck. Flannel vests should be issued in the cold weather.

In Scind the men in the Mountain Battery and Scind Horse wear sheepskin coats in the cold weather, and a garment of this kind would be an admirable dress for sowars generally at early morning parades in the cold weather. The insufficient clothing of the men is unquestionably a powerful cause of lung diseases, fevers, and bowel affections.

The Hussar boots and trousers are very suitable and comfortable to ride in, no alteration need be made in them; the leather is however apt to get hard and dry from the heat; a suitable preparation of oil, &c., might be issued from the Quartermaster's stores to keep them soft.

The Native Infantry.—This important section of our Indian forces is notoriously improperly clad in many respects.

After securing the body from the effects of heat and cold, our object should be to provide a garment or garments of a soldier-like appearance, and that do not interfere with the movements of the body. Now it is very apparent that the present clothing of the native Infantry embraces none of these objects. In the hot weather their clothing is too hot; in the cold weather it is not warm enough, and on the whole their appearance is cramped, and their marching powers, naturally enormous, are marred by buttoning them up in a tight cloth tunic, and encasing their feet in ill-made heavy boots.

As regards the forage cap with its cotton puggree, no change need be made as it is a sufficient covering to the head; it would look smarter if it was cut down a little, as it is rather high.

The Tunic.—The best authorities on army clothing at home unanimously condemn the tight buttoned-up tunic, and regard it as a potent cause of heart and lung affections. (Maclean, Parkes, &c.) Their recommendations have been attended to, and the loose Norfolk patrol jacket is to be the dress of our men at home on all ordinary parades, the tunic being reserved for particular occasions. This is the plan I would recommend strongly as the most suitable for the sepoy; it would have many advantages, as his chest would no longer be fixed as if in a mould, and during active exercise the action of his heart and lungs would be unimpeded. The motion of his arms too is certainly restricted by the tightness of the present tunic, which is an extremely badly-fitted garment.

A red cloth patrol jacket of the same pattern as the one issued to European Infantry would be an admirable and serviceable dress for the cold weather months, and it should be supplemented in its heating powers by a woollen Jersey, which would cover the chest and abdomen. Thin Jerseys should be issued to the men from the Quartermaster's stores; their cost would be trifling, and they would be an invaluable preventive against pulmonic and bowel affections so prevalent among Native troops.

Uniformity on parade with European troops would be promoted; surely nothing can be more unsightly than the present tunic on a slight man—as nearly all Natives are—with its tight sleeves and general bad fit. For the hot-weather months the present white garment is suitable.

At night in the cold weather sentries should be invariably provided with an extra covering, such as a sheepskin coat coming down to the knee. On active service each sepoy should have one of these coats; in times of peace it would be sufficient to have some in each regiment to be worn by the sentries at night.

Trousers.—The present black trousers, if retained in use, would require some important alterations to assimilate them as much as possible to the peg-top pattern, which is undoubtedly the most suitable for Infantry soldiers.

It would be perhaps better to introduce the Zouave trousers and gaiters; the trousers to be made of some thin material, strong and durable, to keep out thorns. They should be wide at the hips and contracted at the ankles and the gaiters might be of plain unpolished leather, sambur skin for instance with a good flap in front to cover the instep. The gaiters would go over the trousers, and need not go higher than 6 inches above the ankle.

Boots.—These encumbrances to a sepoy should be abandoned altogether, and light native shoes substituted. Expecting celerity in movement from a sepoy wearing the present boots is out of the question, nor can they march in them without much suffering and foot-soreness. The boot is dirty too from the perspiration of the foot soaking into the leather, as sepoys wear no socks; and as a rule escorts and the men of Irregular Corps when making long marches take off their trousers and boots, especially in the hot weather, and march in their own shoes; the distance they can then march is astonishing.

This plan of giving the Native Infantry Zouave trousers, gaiters, and native shoes, would be conducive to cleanliness, as at the end of a march the gaiters and shoes could be taken off and the foot cleaned; the foot also would be much cooler and be better protected from thorns in marching through a jungle.

Conclusion.

Before drawing to a close it may be well to state that the writer's object has been to advance the principles laid down by such authorities as have paid most attention to the clothing of our soldiers, and to combine the author's own experiences on what is most useful and comfortable for India. The rude touch of war is the great test of the suitability of a soldier's dress. Under this searching trial everything useless and uncomfortable will surely soon disappear, without any regard to the designs of the tailor or the orders of the martinet. Ornaments and useless encumbrances should never weigh against comfort, utility, facility of repair, and effectiveness.

Should the foregoing views on clothing tend to the improvement in comfort of the British and Native troops, the writer's great wish shall have been fulfilled.

APPENDIX No. VI.

On the Operation of the Contagious Diseases Act of 1866. By T. Graham Balfour, M.D., F.R.S., Deputy Inspector-General, Head of the Statistical Branch.

The result of the operation of this Act in the reduction of venereal diseases has during the past year been much discussed, and very conflicting opinions respecting it have been expressed. It may therefore be useful as well as interesting to show from the numerical returns to what extent any change has taken place in the prevalence of these diseases among the troops at the stations where the Act has been in operation as compared with the other stations throughout the United Kingdom.

It is only in primary venereal sores and gonorrhœa that the immediate operation of the Act may be expected; its influence in reducing the amount of secondary syphilis cannot, from the nature of the disease, be correctly deduced from the statistics of the different stations, and a considerable time must elapse before any marked effect in this respect on the Army generally can be developed.

Annexed are Tables showing the strength and the admissions by primary venereal sore and gonorrhœa at all the stations at which the Act was in operation in the three years 1867-8 and 9, and the same information respecting all the larger stations of troops in the United Kingdom during the same period.

The following Table shows the ratio of admissions by primary venereal sores and gonorrhœa respectively per 1,000 of mean strength at the stations under the operation of the Act and at those to which it has not been extended:—

	Ratio of Admissions per 1,000 of Mean Strength.					
	1867.		1868.		1869.	
	Primary Venereal Sores.	Gonorrhœa.	Primary Venereal Sores.	Gonorrhœa.	Primary Venereal Sores.	Gonorrhœa.
Stations under the Act	86	131	70	129	61	108
Stations not under the Act ..	106	127	108	125	113	99

This Table shows a progressive decrease in each year in the admissions by primary venereal sores at the stations under the Act, while there has been a slight increase in the proportion of these cases at the stations not under the Act. There has been a decrease in the amount of gonorrhœa at both groups of stations, rather more marked at those not under the Act than at the others. The benefit of the Act, therefore, as shown by these returns, would appear to be confined to primary venereal sores, or that form of venereal disease which is likely to be followed by constitutional effects, while it exercises no influence in the reduction of gonorrhœa. This latter result is probably due to the difficulty of distinguishing between the gonorrhœal and other occasional discharges in the female, and the ease with which a vaginal discharge may be concealed when the women appear at the hospital for the purpose of being examined.

TABLE showing the Average Strength of the Troops serving at the principal Stations in the United Kingdom in the Years 1867, 1868, and 1869, with the Admissions into Hospital for Primary Venereal Sores and Gonorrhœa.

Stations.	1867.			1868.			1869.		
	Strength.	Primary Venereal Sores.	Gonorrhœa.	Strength.	Primary Venereal Sores.	Gonorrhœa.	Strength.	Primary Venereal Sores.	Gonorrhœa.
Under the Contagious Diseases Act:									
Devonport and Plymouth	2,443	185	434	2,418	159	359	2,199	162	274
Portsmouth	4,351	504	782	4,928	422	925	4,668	289	586
Chatham and Sheerness	4,481	317	587	4,489	284	699	4,024	163	457
Shorncliffe	..	..	..	..	..	..	2,687	163	271
Woolwich	4,892	432	563	5,003	233	474	5,261	271	465
Aldershot	7,894	638	784	9,879	760	992	10,598	668	1,103
Windsor	..	..	..	1,053	143	66	1,035	96	84
Colchester	..	..	..	..	..	..	1,883	160	273
Under the Act: Total	24,061	2,076	3,150	27,770	2,001	3,515	32,355	1,972	3,513
Ratio per 1,000 of mean strength	..	86	131	..	72	127	..	61	108
Not under the Act: Other large Stations*	34,078	3,624	4,341	32,113	3,458	4,069	25,278	2,851	2,496
Ratio per 1,000 of mean strength	..	106	127	..	108	127	..	113	99

* Under this head are included Isle of Wight, Winchester, Canterbury, Dover, London, Warley, Pembroke Dock, Manchester, Preston, Edinburgh, Cork, Fermoy, Limerick, the Curragh Camp and Newbridge, Dublin, and Belfast.

APPENDIX No. VII.

REPORT on the Sanitary Condition of Labuan, especially with Reference to the Disease prevailing in the Detachment of the Ceylon Rifle Regiment.

Principal Medical Officer's Office, Colombo,
13th October, 1870.

Sir,

I HAVE the honour to inform you that I have received from Staff Surgeon Jessop a Special Report on the sanitary condition of Labuan, with observations on the disease which recently proved so fatal to the Detachment of the Ceylon Rifle Regiment lately stationed there, and that I have also received a condensed Report on the same subject from Assistant Surgeon Barry, M.D., Ceylon Rifle Regiment, the Medical Officer who was in charge of the Detachment in which the disease occurred.

As the former Report is very voluminous, and as both Reports are of a professional character, I beg leave to submit, for the information of the Major-General Commanding, a summary of their contents, with comments thereon; and in doing so it will be convenient and conducive to perspicuity to consider the entire subject under the following heads:—

1. The nature of the disease.
2. The cause of the disease.
3. The measures that should now be taken to prevent a recurrence of the disease.

1. Although at first considerable difference of opinion prevailed amongst the Medical Authorities at Labuan as to what the disease really was, I believe that all are now unanimous in declaring it to be Beri-beri, a disease which, although well known and very prevalent and fatal in this island about sixty years ago, is still but imperfectly understood, and the etiology and pathology of which are still open to scientific research. This disease is in many respects so closely allied to paludal fevers, that it may be, and not unfrequently is, mistaken for them; and one recent authority has gone so far as to deny its existence altogether, and regards the peculiar symptoms which characterize it as sequelæ of fever of the intermittent type.

2. With reference to the cause of the disease, considerable doubt and difference of opinion exists—"Malaria, alternations of climate and temperature, "noxious materials in drinking-water, have all been indicated as operative "agents in bringing about the disease."

Staff Surgeon Jessop, in his letter of the 15th June, 1870, addressed to the Officer Commanding the Troops at Labuan, states:—"And (the disease) is to "be accounted for solely by an insufficient meat diet, and excessive duty, in a "climate where good and generous diet is indispensable with severe duty."

He also, during an official interview which he had with me on the subject, informed me that it was due to "want of nutritious food, night duty involving "loss of rest and malaria."

Dr. Jessop, on the same occasion, also informed me that he considered the predisposing causes were, "insufficient variety of food and clothes and loss of "rest, and that the exciting cause was malaria, but that he was unable to "state the source from which this malaria proceeded." And in his Report now under consideration he appears to attribute the disease to loss of rest resulting from severe night duty and to an insufficient supply of nutritive food.

Dr. Barry, in his Report, states—"I have no hesitation whatever in saying "that malaria was the cause of the disease from which the Detachment of the "Ceylon Rifle Regiment suffered so dreadfully"—in which opinion I believe the Colonial Surgeon at Labuan entirely coincides.

That all these views are in a measure correct I am inclined to believe; for

as the disease is essentially one of debility, it may with confidence be asserted that whatever tends (such as the above-mentioned causes) to debilitate the constitution predisposes to the disease. I am, however, convinced that insufficient food and severe duty involving loss of rest, though doubtless predisposing causes could never *per se* result in the peculiar train of symptoms that characterize beri-beri; for we not unfrequently see these conditions combined without the occurrence of any such disease. And again, the statistics of the disease in Ceylon, as shown in the records of this office, clearly prove that beri-beri, about sixty years ago, prevailed here to a fearful extent amongst both native and European troops who were neither badly fed nor overworked.

We have, therefore, still to ascertain the cause or causes that actually develope this disease in the already debilitated subject. What this really is is still a moot point; but it appears to me more than probable that it is the presence of chlorides, or absence of iron, in drinking-water, or the malarious emanations from swampy ground at stations within the tropics.

In India, particularly at Masulipatam, a strong case has been made out in favour of the former supposition; but in Ceylon, which at one time was a perfect hot-bed of the disease, the latter view seems to be that which finds most favour. In support of the latter I find, on reference to statistics—

1. That from 1795 to 1830, at every station in Ceylon, and particularly at Trincomalee, a vast number of cases of beri-beri occurred amongst both Native and European troops.

2. That as the sanitary condition of these stations was improved the disease gradually disappeared, no cases having occurred for about twenty-five years: and from intimate personal knowledge of the entire island, I am able to state that the military stations are all situated on or in the neighbourhood of ground which was swampy till reclaimed by drainage, &c., &c., at or about the time that beri-beri disappeared.

I may also add that, although the disease has occurred in districts in which the drinking-water was bad, it has not, as far as I can ascertain, ever occurred in any locality that was free from swamp, or in which the laws of modern sanitary science were duly observed, even although the water may then have been impure.

With reference to the recent outbreak of the disease at Labuan, now under consideration, I am decidedly of opinion that, although the men could not at first obtain food quite so nutritious as that to which they were accustomed in Ceylon, and that their constitutions were thereby to some extent debilitated, the disease cannot be fairly attributed thereto, for a meat ration was subsequently issued which made their diet much more nutritious than that which they had in Ceylon, where they never received a meat ration, yet the disease was not stayed. I am therefore very strongly inclined to believe that the *exciting* cause of the disease was malaria, emanating from swamps and imperfectly drained ground in the vicinity of the barracks; for although Surgeon Jessop in his Report does not speak unfavourably of the drainage, he informed me that there was a mangrove swamp to the south-west (and consequently at certain seasons to windward) of the barracks; that there was no subsoil drainage; and that the surface drains were unable to carry off the water after heavy rains. These statements quite coincide with the information supplied to me by the Officers of the Detachment in which the disease occurred, that nearly all the ground in the neighbourhood of the barracks was very swampy.

It has, I believe, been asserted by some that indulgence in narcotics was the cause of this disease. This opinion, however, as far as the men of the Ceylon Rifle Regiment are concerned, is at once proved to be fallacious by the facts that at Labuan the men could not afford to purchase narcotics, particularly opium, out of their pay, and that in Ceylon, where narcotics are about 500 per cent. cheaper, the disease is now unknown.

It may be asked how it occurred that the women and children of the Detachment and the residents of the place did not suffer equally with the soldiers? The answer to this would be, that the soldiers' wives did suffer, but not so severely as their husbands, for they were not exposed to malaria when it exercised its most baneful influences,—viz., at night. And as to the inhabitants of the place, they did not suffer severely, for they also were not exposed at night; and, as a rule, the population of Labuan is a shifting one,

the inhabitants constantly passing to and fro between Labuan and the adjacent settlements; and it is a remarkable feature of this disease that a continued residence from eight to twelve months in the unhealthy district is necessary for its development.

3. The measures that should be adopted to prevent a recurrence of the disease may be summed up as—

1. That as the site of the present barracks is unhealthy, a more healthy site should be selected, on which suitable barrack accommodation should be erected; and if this scheme from any cause is not feasible, I would very strongly recommend that all swampy ground in the neighbourhood of the barracks be thoroughly drained; and should it be found impracticable to do so in any locality, that that locality be screened off from the barracks by a belt of rapidly-growing timber trees.

2. That the water now used for drinking and culinary purposes be very carefully analysed; and should it be found to contain chlorides, or be wanting in salts of iron, that other wells that would supply water more conducive to health be opened and protected by suitable parapets and brick or cement lining.

3. That all low jungle and decomposing vegetable matter in the vicinity of the barracks be removed.

4. That any new barracks that may be erected be *two-storeyed buildings*.

5. That the troops be supplied by the Control Department with ample rations, including one pound of meat per *diem* for each man.

6. That the men be supplied with complete suits of waterproof clothing, and that particular attention be paid to their boots, which should be stout and thickly soled, the ground being nearly always saturated with water.

7. That the duties of the troops be as light as possible, and that night guards be reduced to a minimum.

8. That the Detachment be relieved every six months, or as frequently as possible.

In conclusion, I beg to record my opinion, which may be gathered from the above remarks, that the most active agent in producing the deplorable sickness and mortality now under consideration was malaria, which probably emanated from swamps and imperfectly-drained ground in the vicinity of the barracks.

I have, &c.

W. CARDEN ROE,
Surgeon, Ceylon Rifle Regiment,
Acting Principal Medical Officer.

The Deputy-Adjutant-General, &c., &c.
Ceylon.

[The following consists of extracts from the Report of Staff Surgeon Jessop, who was detailed to proceed from Ceylon to Labuan to investigate and report upon the cause of the sickness and mortality prevailing among the men of detachment of the Ceylon Rifle Regiment stationed in that island. The Report forwarded by Staff Surgeon Jessop, besides being in itself a most voluminous one, is furnished with numerous maps and plans and statistical tables of various kinds, in addition to an Appendix, which embraces the official correspondence of Assistant-Surgeon Barry, Ceylon Rifle Regiment, the Medical Officer in charge of the detachment, relating to the prevalence of disease in question. It has been deemed necessary either to omit these altogether, or to insert only a few of the tables. Although at first some difference of opinion appears to have prevailed among the medical authorities at Labuan, as to what was the exact nature of the disease, it is believed that all were ultimately unanimous in declaring it to have been beri-beri, a disease which was well known and very prevalent and fatal in Ceylon about 60 years' ago. It will be seen that Staff Surgeon Jessop's Report (in accordance with the terms of the instructions furnished to him) deals more particularly with the sanitary bearings of the question so far as they are likely to have affected the origin and prevalence of disease in the detatchment.]

Geography.

Labuan lies between the parallels of 5° 15′ and 5° 23′ 25″ north latitude; and 115° 5′ 45″ and 115° 12′ 30″ east longitude, of the north-west coast of Borneo.

Size.

Its long diameter is from N. N. E. to S. S. W., from Bethune Head to Kiamson Point, a distance of 10 miles. Its short diameter is from east to west, Collin Head to Rimel Point, a distance of 6 miles. Bethune Head answers to Sakat Point and Collin Head to Kalias Point on the western coast of Borneo, being respectively 6¾ and 4½ miles distant.

Islands of Daat, Pappan, Enoe.

To the southward of a line drawn from Kallas Point to Collin Head lies the picturesque and verdant isle of Daat, stocked with a large herd of cattle and a cocoa-nut plantation; 2 miles W. S. W. from this is the small island of Pappan, 1½ miles from the harbour of Victoria; it is swept by both the N. E. and S. W. monsoons, as well as the sea and land breezes; 1½ miles west of this is the smaller island of Enoe, used as a burial place by the Malay population; it is almost in front of Hamilton Point. Between this latter point and Richardson Point is a large sandy bay, studded with rocks and sandbanks, into which three rivers empty themselves. The central one is the only important one; it is called the Saguma, and extends into the centre of the island. A mile-and-a-half to the S. E. is Burong, or Bird Island, a volcanic rock, covered with ferns and overhanging trees; W. by S., 3 miles off, is the large and fertile island of Kuraman; south of this are Little and Great Rusukan, one island. Eleven miles S. of this latter island is the entrance to the river Bruni, leading to Brunei, the capital of Borneo, and residence of the Sultan.

Isles of Burong, Kuraman, Great and Little Rusukan.

Deep bay off Borneo, in which Labuan lies.

A line drawn in a direction S. W. ½ W. and N. E. ½ E., from Kalias Point to Bruni Bluff, a distance of 23 miles, will be found to subtend an extensive semicircular bay with all the foregoing points of land to the north of this line. This bay is known as "Thunder and Lightning" Bay; it is 18 miles deep, and many streams empty themselves into it. It is surrounded by high hills which form a chain extending from Kini Balu in the N. E., to Mount Molu in the S. W. of Borneo, a distance of at least 140 miles. Kini Balu is 13,700 feet high, 90 miles distant from Labuan, the chain 20 to 30 miles distant, averages from 4 to 6 thousand feet high; Mount Molu is 8,000 feet high, and 50 miles distant. On a clear day these mountains can be easily seen, and form a very striking feature both in the scenery, and for their meteorological effects on the island.

Surrounded by high mountains.

Position, Cession, and Inhabitants.

Labuan lies in the direct path of communication between the Philippines and Singapore. It was ceded to the British Empire in 1846, but not colonized till 1848, previous to which time it had no inhabitants, and was covered with forest. Its name signifies a harbour or refuge for pirates.

Shape—triangular, two sides concave and one convex.

Harbours.

It shape is somewhat triangular, and resembles a clown's cap. Its western side, free from deep indentations, is convex, whilst its eastern, or Borneo side, is concave and abounds in shallow banks. The Gungara River discharges itself on this side. Two-thirds of its southern coast, from Point Kiamson to Point Hamilton, is occupied by a deep semicircular bay, known as Watering Bay, it is 3 miles across. To the eastward of Hamilton Point is the harbour of Victoria and Flag Staff Point. The coast line is about 30 miles, and the superficial area 40 miles square.

Geology of the coal measures.

The geological formation is that of the coal measures, large bands of sandstone-rocks, shales, and clays of various consistence and value, with seams of coal, repeat each other throughout island. The northern end of the island contains the highest land, and running in a S. W. direction from and near Kubong Bluff, commonly called Coal Point, are two ridges of hill about 300 feet high, from these diverge innumerable hillocks with attendant ravines over the remainder of the island, having however a considerable amount of table land towards the centre; a large portion of which is swampy. At present coal is only worked at Coal Point. The strata being at an angle of between 30° and 40° requires no great depth of pit, and are easily worked. Into the new mine the miners can walk down till they come to the black shining mineral over head. The kind of coal is lignite or brown coal, it burns without leaving any ash. There are no traces of fern leaves such as we find in English coal, but only exogenous structures of similar character to the type of trees now growing above the sites of the seams of coal.

Coal is Lignite.

Damma. Damma, a resine and article of exportation, is found in large lumps embedded in the coal, and can now be seen as an exudation from trees situated over the coal seams. The shales likewise also exhibit the impressions of leaves growing over-head.

Petroleum. Alum and Iron. Besides coal are petroleum springs, two miles from Coal Point. Also the blue clay at the pit's mouth is rich in alum, and the sandstone in iron.

Trees, forest. The forest trees are very numerous. I wrote down the names of 58 different kinds of wood, 35 of which are all useful, but there are many more; they include ebony, camphor, willow and dye-woods.

Fruit. If the forest trees are numerous, the fruit trees and vegetables are equally so in comparison.

Coffee is cultivated to a small extent, but never likely to be productive. Mulberry trees are grown exclusively by His Excellency the Governor for his silkworms.

Among the fruits we find pine apples, bananas, water melons, oranges, rummelons, the finest in the world, Chinese and Indian gooseberry, tarop fruit, jamban, blunbing, bread fruits, melons, limes, cashun nuts, jark, dorian, bolona guava, mango, mangostim, papan, almond, sour-sop, figs of several kinds.

Vegetables. Among the vegetables we have sweet potatoes, chillies, yams, pumpkins, onions, green gram, tamarinds, aroe-aroe, catechu, or gambic, bimjales, beans of two kinds, Kotoh cucumber. Salad (lettuce leaves), assam klumbe, cocoanuts, sago and nebong palms, castor oil plant. Also among the garden trees—roses, jessamines, flambeau, senna, cinnamon. &c., &c.

Animals The animal products are mouse deer, deer, wild pig, curlew, snipe, white ants and boa-constrictor, no other snake.

The practical inference from this varied list of trees, fruits and vegetables, is that the soil is good.

Exports. The exports sent over, or obtained from Borneo, are black and white birds' nests, gutta (India-rubber), damma, gutta-percha, sea pearls from the Sooloo Seas, exported to China for medical use. Also bees'-wax for the English market from Borneo.

Cultivation of Sugar and Rice. There is cultivation both of rice and sugar cane in the interior of the island.

Grazing land, good. The land is in many parts very rich, and capable of producing good grass for pasturage; but this up to the present time is a branch of industry that has not excited the attention it deserves.

Having given a general idea of Labuan, its size, physicial features, and productions, I will now endeavour to describe the interior of the island.

Interior of the island. The approach to Victoria Harbour by sea lies to the southward of the islands of Rusukan, Burong and Enoe, and to the westward of Pappan, as shown by the red line on the chart.

Harbour. The harbour commences at a line drawn from Hamilton Point to Flagstaff Point. On the left side and in front, the shore is fringed with mangrove trees, and dotted with wooden houses on piles over the water, or else peeping out from among the trees on the high ground, while rising beyond is a forest of bare and blackened poles, gradually thinning till lost in clearance. On the right is a long low sandy beach, rather more than a mile in extent, commencing with a row of cassnanira trees to the Flagstaff. Three-quarters of a mile from this is the wooden building of the Government offices, raised five feet from the ground. Between these two point extends Victoria Plain, three-quarters of a mile in width, bounded by the rising ground of Collin Head, near which are seen the jail, bungalows, &c., up towards the cathedral and Government house grounds.

Mangrove fringes and pile dwellings.

Sandy beach.

Perspective.

View beyond Victoria Plain.

Town. Beyond the Government offices is a long row of attaps, sheds raised about 2 feet from the ground, extending for 150 or 200 yards, next a shorter row of wooden attaps, covered sheds, and four or five blocks of red-brick houses two stories high terminate this low sandy shore.

Fish Market. In the centre is the fish and vegetable market, built on piles, uncovered at neap tides; it is 60 yards from the shore. Higher up is the jetty, alongside which vessels of some draught can be moored. An imposing row of lamps and posts light the town. The back-ground of the town is formed of cocoanut trees, with stately forest on rising ground beyond. Such is the city of Victoria, Labuan.

A broad tidal drain separates the cocoanut plantation from the town, and between the town and drain is some ground, about 100 yards wide, covered with crab heaps and holes. These holes are partially filled with cocoanut husks and other refuse. As shown in the plan, to the left of this ground will be the terminus of the proposed tramway from Coal Point, and also of a road in course of construction through the Batu Arrang district. Tidal Drains at the back of the town.

The road from the town to the interior of the island winds round the Government Office across the tidal drains through the plain. It is three-quarters of a mile in length, broad and good, having on either side a row of senna trees, and a tidal drain. On its right is the plain of Victoria; for half its length, on the left, the above-named cocoanut plantation; and for the remainder of the distance a large square plot of ground in possession of crabs, with their innumerable heaps and holes, a few palm trees and low brushwood, chiefly delania with its yellow flowers. This plot of ground has tidal drains (coloured blue on the map) on three sides. In spring tides it is considerably flooded. Road from town. The Road through Victoria Plain and cocoanut plantation, and "crab heap plot."

The plain of Victoria is formed of a deposit of conglomerate and sand with loose black soil, covered with grass and interspersed shrubs. It was on this ground the first settlers took their stand. Their graves are about 200 yards distant from the Flagstaff. The cocoanut plantation and contiguous ground has a somewhat deeper layer of black soil. Geological character of Victoria Plain.

The Coal Point road is here crossed transversely by a green lane. At this point also the ground commences to rise, and is undulating. This green lane on the right forms the northern boundary of the plain of Victoria, and on the left ends in the mangrove swamp, but ultimately will be connected with the road through the Batu Arrang district. Both sides have tidal drains. Those on the right are not so open as those on the left, but still are daily swelled by the tide. Green lanes with tidal drains.

Following the Coal Point road for the next half mile, we find a thoroughly English narrow hedge-and-ditch lane, which gradually rises to the church, where it turns to the left, and is on the right met by a branch road. The ditches on each side of this lane are deep and fairly kept. The hedge is of limes, cotton, &c., &c. The country on the right side, occupied partly by a cocoanut plantation, and some few wooden bungalows, gradually merges into land once cleared of forest, but now covered with fern and secondary jungle. On the left a cleared compound running out to a spur with a wooden bungalow; adjoining are Government House and grounds. The entrance to these grounds, and the way they are laid out, forcibly call to mind English scenes. The trees are tall and the foliage rich; the grass is grown, and oxen and cows of English appearance browse quietly in the park. The house is, like all the houses in Labuan, built entirely of wood, chiefly camphor. Coal Point Road. Government House and grounds.

Leaving these grounds by the upper gate, we are opposite the Cathedral, which stands at the top of the lane. As shown in the plan, it stands on a triangular piece of ground 88 feet above the sea level. It is one of the best sites on this table-land, for it overlooks the whole of the undulating ground above Victoria Plain, and has an extensive and picturesque view. Ferns of a common English type, and secondary jungle, overspread this ground. The Cathedral, without aisles or pillars, is in the Gothic form, and built of wood, raised 3 feet from the ground. It will accommodate about 50 persons, the usual attendance being but 8 or 9. Cathedral—its position, elevation, form, size.

The road to the right runs through forest land, cleared, but now overgrown by secondary jungle; it passes the billiard-room to join the upper road near the civil hospital. Roads to the right are an upper and lower. The upper is used by the Jail Guard daily.

The upper road is the best of these two roads; it is more circuitous, and runs from Victoria Plain past the jail, civil hospital, to the back of the church; it is like a lane, and the hedges are of limes. It is a gradual rise from the jail to the limes, and is the route the jail guard takes daily. The land about this road is private property. There are two or three wooden houses at its side. On the right, a quarter of a mile off, is forest, towards which I found a good spring of water, which the occupant of the land, a Dholin, informed me never ran dry: it had a pleasant taste. The allotments are gradually filling with ferns and jungle. Good water.

Coal Point Road continued through the lines.

This road joins Coal Point road behind the cemetery, and leaves the Lines on the left on its way to Kubong Bluff.

Character of ground on the right.

On the right the ground from this point to the first road is covered with ferns and low bushes; it is wet, but not more than would be expected from the large rainfall. It is not in occupation, and except the large road drains and a general district drain, is undrained. Following this road to the right, I went through almost impassable jungle to the sea.

Beyond this road the country is cleared for another quarter of a mile, and then commences a forest of bare and blackened poles, relieved by living trees in the distance.

Character of ground on the left. Ravines. Officers Quarters, Hospital, and Barracks. Soil—its character and drainage.

Going back to the cemetery, we find on the left hand side the ground is bare, free from jungle, and but thinly overspread with grass, for the silver white sand is everywhere visible. Ravines here commence, and run down through Government House grounds; first in order is an officer's quarters, then the hospital guard-room, store-room, magazines, barracks, cook-houses, &c. A small amount of secondary jungle and forest up to the new road through the Betu Arrang District. The character of the soil is black peaty over silver sand and clay, but differs greatly as to depth in different places. It certainly holds the water, but not more than would be natural for the large rainfall. There are good large general drains to carry off the superfluity.

Coal Point Road. New road on the left.

Following the new road above referred to, we at once enter forest filled with lofty trees, some charred, standing upright, some lying horizontal. Looking towards the right is seen a valley green with paddy and hillocks, covered with sugar cane, while in the distance of the Rancha-Rancha district, the forest of bare poles noticed on first landing. To the left is dense forest of small extent, and in front the mangrove swamp, through which this road is to pass to the town, but at present incomplete. On the right one or two bungalows and a spring of excellent water. From this neighbourhood runs a stream of excellent water, fresh and pure, to the back of the town; it supplies the sago manufactory of Choo Maksoo and ships, when they require it, but in consequence of the distance the flag-staff well has been sunk, and is now available as a source of good water. The Government intend to supply the town with this water.

Good water.

Supplies a sago manufactory and ships.

Road through the forest.

The Coal Point road, from the place where it is joined by this last road described, for the next 3½ miles passes through dense forest. It is tortuous, undulating, and rugged. About the fifth mile-post there is a clearing—the road descends considerably, and is not good. A village on the right is springing up, and the country wears a busy aspect. From this point to the sixth mile-post the road passes through a large swamp; it is offensive, and formerly was considered very fatal; it has been much drained of late years, and has greatly improved in salubrity; much is still required to be done to render it harmless. It can, however, have no effect on the locality occupied by the troops, in consequence of the dense forest which intervenes. The remainder of the road is by the sea shore, under overhanging trees; it crosses the River Gungara, over which is a new bridge available for carriages; by paddy fields, bungalows, &c., till it ascends the hill hemmed in on the left by tall and varied forest trees, while to the right the ground is undulating, and varied by palms of different kinds.

Swamp cannot affect troops.

Gungara. River and bridge. Road terminates at Coal Point.

Village healthy.

The village of Lobaktimiony-under-the-Cliff is seen on the sea shore; it had a clean and, I am assured by the Assistant Colonial Surgeon, a healthy population, which is employed in the coal mines.

Coal Point.

The road at the top of the hill, 150 or 200 feet high, turns down the tramway from the mines towards the jetty in a kind of ravine. The ground to the right has a considerable elevation; the Police-station and workmen's bungalows are scattered over it. The ground on the left is formed into hillocks, each hillock surmounted by a bungalow. The Manager's house is situated on the northern ridge, overlooking the sea; it is quite open; it is 200 feet above the sea level.

The coal mines are two miles from this. The character of the ground is the same, except that the hillocks are larger, higher, and covered with forest.

Sanitary condition about Coal Point.

The sanitary condition of the whole place seems to be tolerably good, and without much trouble or expense can be greatly improved. There is here a brick manufactory on a small scale, which seemed in fair order. The workmen

do not use the aluminous or chalybeate water found near the mines for drinking purposes. The temperature of the new mine is cooler than that of the outside air. All the workmen appeared to me to be robust, and not more dirty or wet than colliers in England—in fact less so.

Coal Mines.

From the subjoined section * it will be noticed that the greatest depth is not more than 45 fathoms. There are at present 30 English miners; about 2,000 cubic feet are cut daily; of this one-third is lost in dirt, leaving from 40 to 50 tons of good useful coal.

Use of convicts.

The Government lend the convicts to load vessels with coals. This, besides filling the Treasury, is a change of labour to the convicts, and keeps them in good moral health; for those who behave well are permitted indulgences which cannot fail to cheer them in their forced labour.

Sanitary recommendations for Coal Point.

It would be an immense advantage if the manager, twice a year, could spare all hands for a few days to attend to drainage, with other sanitary precautions, such as removal of, or levelling of, all accumulation of refuse from the mines. By thus keeping in check untidiness, he will lessen the chance of any hidden source of disease in the future.

The above equally applies to any part of the island, and twice a year is necessary, because the vegetation is so luxuriant, and the rains are so heavy.

Extracts from Dr. Cooper's Report on Labuan for 9 years up to end of 1863.

I beg leave here to introduce a few remarks abridged from, and extracts of, *Dr. Clarence Cooper's Report for 1864*. Speaking of drainage, he says:— "Drainage is principally carried on in making roads, some through extensive "swamps; and the difficulty of their construction was immense, considering "the only labour then at command." Up to 1857 the resources of the local Government were not equal to keeping in order the extent of jungle cleared, and it again became overgrown; in sandy districts the drains silted up and fell in. This produced an increase of fever. Since then, convicts have been extensively employed in draining and making roads, &c.; but even at the present time (1870) to carry out extensive sanitary arrangements by increased roads and drains, &c., requires more labour than is at the disposal of the Government.

"The jungle here is perhaps as dense as any in the world. Gigantic trees "rise to a height of from 200 to 300 feet, with stems 150 feet to the first "branches. Under these, in endless variety and of all sizes, grow trees and "shrubs, getting thicker and thicker the nearer to the ground, and matted "together with rattans and creepers of all kinds.

Method of clearing the jungle formerly, and at the present time, by the Kadyans.

"In clearing this jungle a large number of iron-wood trees and others of "great hardness were met with, which the small axes of the Malays were "unable to make an impression on, and which consequently were left standing. "Fire was applied to large tracts thus cut down, the small jungle, and in "many cases the large trees, were consumed, but an immense proportion of "the gigantic trunks, merely charred on the surface, were left lying about in "every direction, and many of them remain to this day." (1864).

The Kadyans at the present time follow the above description in the centre of the island—when they plant sugar-cane on the hillocks and paddy in the ravines for a year or two; they then move off to some other plot to do the same again. This practice is, however, likely to be discontinued as injurious to the health and prosperity of the colony.

Climate.

The climate of Labuan seems to be an agreeable one, if it is to be judged by Ceylon. Those who have lived in both places, state that they enjoyed better health in Labuan than in Ceylon. Persons resident in Hong Kong also have spoken more favourable of it. And those resident in Labuan 12 and 13 years ago also speak favourably of it. And those who have been resident for more than 15 years, both Europeans and Natives (Chinamen), are still alive and hearty.

Looking over the meteorological records, we do not find a higher thermometrical reading than 93°, or a lower than 70°; these occurred in the year 1866, and are no criteria for the mean annual range extending over six years.

The mean annual temperature is not quite 82°; and that the mean range for a period of five and a half years is but 10·3°. These two facts alone show that the climate is an equable one, and must have an important bearing on certain classes of disease.

See Maps and Plans.

It would appear that each month has but 12·6 rainy days, with an average of 11·52 inches of rain for the month, giving ·91 parts of an inch for each rainy day. This calculation is taken from the larger Table, and the rainfall calculated exactly for the number of rainy days in each month.

It must, therefore, be considered that with a rainfall such as this, ground that in other countries would be considered dry, must in this, to some extent, be considered wet. Nevertheless it is a remarkable fact, speaking well for drainage arrangements, that, with the exception of a few places, water does not lodge to any extent; and that after a few days freedom from rain, the ground becomes perfectly dry. Evaporation is of course very considerable, and accounted for by the very free circulation of air over and through the island.

Dr. Clarence Cooper, in his Report for 1863, says—"The N.E. monsoon "prevails during the months of January, February, and March, the weather "then being usually fair and dry; and the S.W. monsoon from June to "October or the middle of November. During the other months the winds "are variable, and in April and May light; but calms are infrequent and "never of long duration, as sea and land breezes, N.W. and S.E., are produced "by the mainland of Borneo, which, on its N.W. aspect, is mountainous and "covered with jungle."

It will be recollected that there is one extensive mountainous range extending from Kini Balu in the N.E. to Mount Molu in the S.W. of Borneo. "These ranges," says Dr. Cooper, "accumulate the clouds from the China Sea, "and account for the very frequent thunder-storms which prevail, as well as "for the heavy rainfall; this last during the last ten years has averaged 160 "inches in Labuan; on the coast it is probably much heavier. The rain "being brought from the mountains by the land breeze, most commonly falls "at night; a completely wet day is of very rare occurrence indeed. The first "three months are usually dry; April and May showery; June, July, and "August wet. There is generally a short dry season about September; and "October, November, and December are very wet.

"The extreme range of the thermometer is from 71° to 96°; the variations "are not usually great. The average temperature by day is 84°, and by night "75°. The S.E. wind is the coldest."

Dr. Treacher, the Colonial Surgeon, confirms the above, and states, "the "first three months of the year are healthy. In all the wet months there is "an increase of fever. This year, 1870, the N.E. monsoon did not begin till "February, and it was an abnormally unhealthy season."

The civil hospital stations, and those of the jail, as far as I was informed, do not bear out this statement. "The great part of the year, there is no "monsoon, only sea and land breezes." The sea-breeze from the N.W. begins about 1 P.M.; the land-breeze from E. or S.E. early in the morning, and an important one for sailing vessels going to Labuan. The S.W. monsoon would appear to be stronger and more prolonged in its effect on the island than the N.E. monsoon.

The rainfall for the year 1869 was much in excess of any previous year, being 182·5 inches; and if attacks of ague are in any way dependent on the rainfall, we have, in part, some kind of a reason why ague attacks last year were so numerous.

The Manager of the Coal Company at Coal Point has furnished me with a Table of Rainfall at Coal Point which bears out his statement that the great bulk of rain in a month falls in from five to six days, and chiefly at night. The quantity one night amounted to 7 inches.

Rain Fall. Comparing the rainfall at Coal Point with that at the Lines for similar months in the year 1869, there is a considerable difference between the two sets of observations, and is partly accounted for by difference of elevation, the Lines being 100 feet lower, and eight miles distant. It does not account for the difference in wet days, the numbers being, from May to October inclusive, at Coal Point 77·97 inches in 116 days, Military Lines 126·9 inches in 80 days.

These numbers show that the chief bulk of the rain falls during the prevalence of the S.W. monsoon.

Dr. Clarence Cooper states that the large rainfall is due to the mountainous ranges in Borneo collecting the clouds from the China Sea. I cannot quite

concur in this view, because we have the greatest rainfall during the S.W. monsoon. The belt of equatorial calms extends from 5° south to 12° north latitude. In July and August it is found between 7° and 12° north. In March and April between 5° south and 2° north. Hence it follows the sun in his northern and southern declination; and in countries between 5° and 10° south and north latitude there are two rainy seasons and two dry.

Labuan lies between 5° 15′ and 5° 23′ north latitude, and comes entirely under this rule. It is, however, much modified by the high mountain ranges in Borneo, and the equatorial cloud ring is massed on this range instead of being evenly spread over this portion of the globe. When the sun begins to go north, followed by the belt of calms, the weather is fair and fine at Labuan, because the heated air draws in the fresh N.E. monsoon (certainly not cloudy). The more vertical to Labuan the sun becomes, the less stronger is the breeze. The moisture collected in the southern hemisphere, instead of coming down, is massed on the mountainous ranges of Borneo. As the sun still goes north the clouds pass from the central to the N.W. ranges of Borneo, and it is only when the sun begins to return south, heating the air in his track, that the S.E. trade, which is broader than the N.E. trade, drives the clouds over the range nearest to Labuan, and inundates the island.

Thus, then, we see why calms are so infrequent at Labuan, and why, at the change of the monsoons, the land and sea breezes are the prevailing winds. The rainfall at night is also accounted for by the land breeze from the lofty hills near Labuan.

I could say much more on many interesting points, but will conclude with an extract from a despatch of his Excellency the Governor, dated 18th November, 1868.

Climate.

"The climate of Labuan closely resembles that of the warm summer months "in the South of Ireland. The temperature is far lower than in most of the "Queen's Eastern dominions. It varies very little during the year, the ex- "treme ranges being from 71° to 90°. Its insular condition, its proximity to "the highest mountain ranges in Borneo, and its relation to the equatorial "cloud ring, no doubt accounts for the remarkable fact that the rain generally "falls at night.

"The perpetual verdure of the island, its numerous stately trees and flowering "shrubs, and the luxurious foliage of the adjacent islets, render Labuan ex- "tremely beautiful."

Barracks—elevation and situation.

The barracks are situated towards the S.E. part of the island, a mile and a quarter from the town of Victoria, on the highest table-land, 96 feet above sea level. They are placed 30 yards N.E. from the edge of a ravine commencing at this northern boundary, the site being marked by a shallow surface-well used for ablution purposes.

Wooden huts.

They consist of six wooden huts elevated on brick pillars three feet high, distant from each other about twenty yards; the short diameter of each faces N.E. and S.W.

Barracks—3 in line; size and construction.

Three were built in 1851; they are in line. Each is 100 feet long, 10 feet high, and 16 feet wide, with floor, sides, and ends of plank; no ceiling, and a roof of attaps, the ridge of which is 18 feet from the floor. At the S.E. end of each building is a small room partitioned off, 20 by 16 feet, for the use of a non-commissioned officer. Each building has two verandahs, 7 feet wide, on its long diameter, protected by attaps roofing, which slopes from the central ridge. There are four doors on each side, and a window in each end.

Three in echelon.

Three are in echelon; one built in 1852, the other two not till 1865. They are constructed precisely as those in line, except that the sides are 11 feet high, and the height to the central ridge is 20 feet 6 inches; also the verandah runs all round instead of being confined to two sides. They have also venetianed doors, and the lowest plank on each side is moveable by hinges.

Native Officers' quarters.

The Native Officers' house is a small square building, with three or four rooms and verandahs, raised about 3 feet from the ground. This was given up by the Government for their use, and is not suitable for any other purpose. It is placed between Barrack Room No. 6 and the Hospital.

Hospital—its position.

The hospital, built in 1854, is situated S.E. by S. of the barracks. It is an oblong building; its short diameter facing nearly north and south. It is placed in a sort of peninsula, at the end of the plateau, with a belt of trees

round, and the ground dipping down into deep ravines on three sides, the fourth or front looks down the whole length of the lines. The ravine running round the hospital separates it from Government ground and house 50 feet below.

Construction. It is built on a brick foundation 2 feet high, plank walls externally and lath and plaster internally; plank flooring and wooden ceiling; a verandah, 7 feet wide, running round it formed of chunam. The whole building covered by a sloping roof of attaps, renewed in June last. The brick foundation is perforated by four squares for ventilation beneath the flooring. By the 12th July these had been enlarged, the ground beneath cleansed and strewed with charcoal, according to my suggestions before leaving Labuan on 17th June.

Two wards—size. The building is divided into two unequal wards communicating by a central door-way. Each is 17 feet wide, and 11 feet 10 inches high. One is 38 feet 6 inches long, and the other 26 feet 2 inches long, giving a joint cubic space of 13008·71 feet; and a superficial area of 1097·8 feet. On each side are fine venetianed doors, and one at each end opening on to the verandah. The

Verandah rooms. corners of the verandah are petitioned off into rooms; those in front looking towards the Lines are enlarged and make rooms about 13 feet square; one is used as a surgery, and the other as a store room. They have all chunam floors.

Cook-houses. The cook-houses are sheds with a partition rendering them double, as indicated on the plan. They are divided so as to form several small cooking-places for the different families and messes. They are constructed entirely of kajang and attaps. I think they are too far off the barrack-rooms.

Latrines. The latrines are superior places of accommodation, being built entirely of plank, with plank flooring, sides, and roof. They are constructed for use on the dry-earth system. There are three for the use of the people in barracks. That for the hospital has a bath-room with a tub adjoining; it is constructed as the others, with the addition of an attaps covering. The receiving buckets are of wood, and are not offensive when a sufficiency of earth is used.

Other buildings not used. In the nullah, to the east of the hospital, are three buildings, a Hospital Serjeant's Quarters, a good cook-house, and a mosque. Their situation is inconvenient, and they are not used in consequence. I have recommended their removal to a more convenient locality.

Ventilation. Ventilation for the hospital is sufficient, and all that could be wished. For the barrack-rooms it is deficient. The only means is a small aperture between the roofs and sides, in the married quarters; but in barracks 4, 5, and 6, the lowest plank is moveable, and there are venetioned doors, but these are all closed at night.

Sanitary condition of the neighbourhood. The sanitary condition of the neighbourhood will now be understood, if what has gone before is remembered.

Character of ground to be improved by cattle and quick lime. The ground on which the Lines are situated is composed of sand with underlying yellow and blue clay, and sandstone, rock cropping out occasionally; this is covered in part with a black (peaty) deposit which does not produce very good grass, in consequence of the large amount of acid in it, it might be improved by sprinkling with quicklime, and turning cattle into it, the latter suggestion has been already adopted, since 17th June.

Drainage. The drainage is good, though in some places where there is a greater thickness of black soil, draining pipes would be, when procurable, useful in removing the deeper water which the ordinary drains do not affect. Considering, therefore, the heavy rainfall, the vicinity of the barrack-rooms may be considered dry, as also are the buildings themselves.

Sanitary conditions of barracks. On inspecting the barracks and their immediate vicinity, I found No. 1 overcrowded and the flooring in bad condition. There was no overcrowding in Nos. 2 and 3, but the floors were in bad repair.

Married lines. These three buildings (1, 2 and 3) are occupied by the married people, and are divided by kajemy partitions, with a central alley two feet wide, into several small oblong rooms, each averaging eight or nine feet square, in which a man, his wife, and two or three children live. There was only one bedstead for the husband (usually occupied by boxes, &c.), and a mat as bedding; the rest slept on the floor on mats.

In barrack-rooms Nos. 4 and 5, occupied by single men exclusively, I found the floor of No. 4 was good; not so that of Nos. 5 and 6. This latter (No. 6) is divided into two unequal parts—the smaller used as a school-room, the larger formerly as a recreation-room, but latterly as an additional hospital. Single men's quarters.

Scattered all over the ground were small heaps of semi-burnt brushwood, chiefly to the south of the barracks, abutting on the jungle beyond the barracks; but behind the kitchens, latrines, &c., extending from the furthest cook-house up to behind the hospital was refuse of all kinds scattered about, such as fowls' feathers, ashes, large pieces of wood, decaying attaps, sugar-canes, cocoa-nut husks, dead brushwood cut down, but not collected and burnt, bamboo leaves unswept up and rotting. A similar condition existed in the ravine between the Officers' quarters and hospital—low brushwood cut down, unburnt, with animal matters. Condition of the ground generally. Sanitary condition of neighbourhood of the barracks.

In front of the lines is an arrack shop with decaying refuse similar to the above behind it. In an adjoining compound also was some similar untidiness.

The Coal Point Road runs past the barracks, and within the last two years has been considerably widened and improved, and deep drains cut on either side for more than a mile, while cross drains have also been made.

On either side of this road the ground is covered with ferns and low brushwood, and though wet after heavy rain, is yet fairly drained, and only requires time, labour, enclosures, cattle, and quicklime to render it good pasture land.

The barracks are exposed to both monsoons, and sea and land breezes. The men complain of the wind blowing from the N.W. as being very cold. The manager at Coal Point makes the same remark, with reference both to himself and the miners. It is described as "a damp, cold feeling, which puts you out of sorts." This wind is chiefly noticed at the change of the monsoons. At Coal Point, a mangrove swamp near the sea-shore was considered the cause of the unpleasant effects of this wind. Wind passing over wet ground will be more or less influenced in its effect on living objects by having passed over such ground; but to effect this there must be a sufficient length of land for it to pass over before it can be influenced, or imbibe, any noxious qualities. What then are the facts of the case. From the Lines to the nearest forest, in a direction N.W., there is not in a straight line, at the outside, more than a quarter of a mile of land covered with low brushwood and ferns, and suppose it damp. Beyond this are very tall forest trees. At Coal Point we have the tall trees within less than a quarter of a mile, gradually rising higher and higher to nearly 400 feet. Here we have no wet ground for air to pass over between the trees and pits, but admit such a tract on the other side 300 or 400 feet lower. Now the supposition is of some persons, that this N.W. wind at Coal Point picks up deleterious matter out of the mangrove swamp, and that this matter rises by aid of the N.W. wind over the tall trees to attack the miners. The same at the Lines: the N.W. wind is supposed to hop suddenly down and search all the ground for a quarter of a mile for some malaria to afflict the troops with a mortal disease. I will not assert that the above may not be the true explanation, but I venture to suggest that the wind from about this quarter, passing over and through the tall forest trees in its passage becomes deprived of its warmth and moisture, and that before it strikes miner or soldier it has not been exposed for a sufficient length of time afterwards to the influence of the sun's rays to regain its warmth. On reference to a chart, there is no geographical reason why the N.W. wind should be colder than the north-east wind—for this latter is not a cold wind, and travels over a large tract of sea, greater than than that of the north-west wind—yet this latter affects the thermometer at the pits' mouths. The miners complain of it; the soldiers complain of it; and the reason they do so is, because the wind, having been deprived of its moisture, is drier and colder, abstracts heat and moisture rapidly from the body, producing the sensation of cold and dryness of the skin, with ultimate congestion of the internal organs. The soldiers, to some extent, do complain of the north-east monsoon, and for the same reason; but the forest tract is less and more open, the season is the dry one, and living beings do not feel any sudden change in temperature so keenly as they do when the hygrometric condition of the air is near its maximum. Monsoons and other winds, and effect on miners and soldiers. Sanitary condition of Lines.

If the above explanation is not accepted, I certainly do not believe that

this wind wafts any miasm towards the Barracks, for there is no great amount of decaying vegetation, and where there are not small shrubs there are grass and ferns; that is, living action is going on, and whatever miasm does arise the nightly rains dissolve, and it is carried off by the drains; but evaporation may be and is rapid, still, as miasm is decomposed by solar influence we cannot have any large amount free. Although the low-growth and secondary jungle near the lines is considerable, still it has been greatly diminished since the arrival of the Ceylon Rifles, and as it is living it does not produce malaria. Again, the ground is of peaty character, and holds the water; ferns do grow, and may lead to the idea that malaria of necessity must be generated; still what would the neighbourhood be but for the road, its drains and cross-drains? Certainly a regular swamp. But do peaty soils emit malaria? Do green swamps? The only decaying vegetation in quantity seems to be the scorched and blasted trees, which at a distance look like a forest of masts; and if charcoal does possess virtue, it must in these tall and stately embers still assert its sway.

Water. The supply of water in wet weather is plentiful, and the wells are all full, but I cannot think it to be wholesome unless filtered. At this period the ablution supply is also abundant.

There are five wells within 200 yards of the barracks and hospital, only one of which has a house over it, or the well protected at its edge by a parapet. To commence with this—

No. 1 Native Adjutant's Well is near the Orderly Room and opposite the Married Quarters, it is round, lined with wood, covered by a house open at the sides, 25 feet deep, 6 feet 3 inches in diameter. Runs dry when two-thirds of the dry season are over; it is much used for culinary purposes, cooks vegetables well, not much used for drinking purposes. When full the water of this well is clear, but it muddy as the dry season advances; its taste is disagreeable, saline, and mawkish; has no smell, makes a good lather with soap; little sediment; under the microscope, amorphous dark non-angulated particles and transparent angular crystalline particles, not changed by nitric and hydrochloric acids; parenchyma of leaves; nityselica sigma.

Reaction neutral, a slight precipitate with nitric acid and nitrate of silver; nitric and nitrous acids none; no ammonia by Neslor's test; no lead; no sulphuretted hydrogen; no iron, either with tannic acid or furocyanide of potassium.

Mosque well. No. 2 Well, outside the Mosque, 50 yards to the south of the last. It is round, and lined with wood; edges are overgrown with grass, which encroaches on the water; it is 33 feet deep, and 4 feet wide; it may be considered a weak spring, for it never runs entirely dry, though more used than any other well. In the well the water appears brownish; scarcely preceptible in a glass; it tastes like river water, not sufficient to be disagreeable; has no smell; forms quickly a good lather; cloudy sediment, showing amorphous non-angulated particles, woody fibre and parenchyma of leaves.

Reaction neutral; cloudy with nitrate of silver. All other tests negative.

No. 3 Well, inside the Mosque enclosure, is 21 feet deep, with wooden sides; it is 4 feet square; runs dry quickly, and not much used; it is transparent and tasteless; it is said to have a sour taste; no smell; forms a good lather with soap; amorphous particles and parenchyma of leaves; its chemical examination gave the same results as No. 1 well.

Hospital nullah well. No. 4 well. Hospital nullah well, situated at the head of the ravine between the hospital and officers' quarters; it is 15 or 20 feet lower than the parade ground; nearly 4 feet square and 7 feet deep, with wooden sides; runs dry quickly; used only for ablution purposes; situated under a tree; it is brownish in colour and turbid; is unpleasant to taste and disagreeable to smell. Forms an imperfect lather with soap; throws down more sediment than those detailed; shows various infusoria cutinophryssol and minute moving particles—amorphous non-angular particles and parenchyma of leaves; its reaction is neutral; less turbidity than the others on adding nitrate of silver. The remaining tests gave negative information.

No. 5 well in Government House grounds behind the hospital, 75 feet below, in the ravine, and under a tree. It is simicircular in shape; 3 feet deep; has

no wooden sides; is 4 feet by 3 feet in diameter. The ravine stream passes about a yard from it, and water is always running down, except in the dry season. This well never gets lower than 4 inches from its full level. The patients in hospital use this water; it is clear and transparent; at present it has a disagreeable taste and smell never noticed before; it loses this after filtration, and is very good. The chemical evidence the same as other wells.

The above well is situated in the ravine, and is the well alluded to in the dispatch of His Excellency the Governor, 15th February, 1868.

No. 6 Well. About 2 miles from the Barracks, on the Coal Point Road, 200 yards from the Dorian Choudong Police Station, on the right-hand side, and off the road about 30 yards at the head of a ravine, 25 feet below the road a spring gushes out of the sandstone-rock. It never runs dry; it is clear and transparent; no smell, and a pleasant taste; it is rendered slightly turbid on the addition of nitrate of silver. It conforms to previous descriptions in its chemical and microscopical characters.

No. 7 Well at Coal Point, is 100 feet above sea level; never runs dry; it is a hole in the sandstone, and gives pleasant and clear water. It is used only by the Manager. In other characters it agrees with former descriptions.

The ground here is very hillocky, and abounds in cocoa-nut trees, sago, and *Nebong* palms.

No. 8 Well, or the *Engineers' Well*, is used by all the workmen at Coal Point. It is an active spring of very clear water, situated at the foot of a hillock, and at the head of a pullah, producing a constant stream; it is covered over and well-protected from dirt; it is 90 feet above sea level; it is 4 feet by 5 feet, with sides of wood, and 3 feet deep; it has a soft and slightly metallic taste; algæ in abundance; does not form a good lather with soap; turbid with nitrate of silver. For the rest, answers to other wells.

No. 9. The Peon's Well, 100 feet above sea level; is 18 feet deep; runs dry in dry weather; it is 2 feet square, with sides of wood; forms a ready lather with soap; algæ and fragments of vegetable matter. The rest as above.

The next wells are in the south of the island.

No. 10. Billiard Room Well, under a tree; said never to run dry; about 3 feet deep, 3 feet square, with wooden sides. Has properties the same as other wells. The people living in a house close by use this water and enjoy good health.

No. 11. Mr. McClosky's Well, opposite the Civil Hospital. It is situated in a ravine behind his house, a dell surmounted by mango, rambortine, and cocoa-nut trees; the sides of this dell are wet and covered with ferns; the ground is peaty; it is 25 feet above sea level; the well is square, boarded and carefully covered over; 5 feet 6 inches deep, and 4 feet square; it is always running; in dry weather supplies the jail, civil hospital, and people in the plain; it is clear and transparent, makes a good lather with soap.

No. 12 Well, outside the jail, is about 30 yards off the road, in a hollow at the top of a ravine, 15 feet below the road; it is 16 feet deep, and 4 feet square, with wooden sides; runs dry; has a good road ditch stream of a brownish colour passing by it; the ground around is wet and boggy; the water is clear, transparent, no smell, pleasant to the taste, forms a good lather.

From this well Sepoys and Malays on jail-guard duty used to drink.

No. 13 Well, situated within the jail compound: it is 60 feet deep, and 6 feet in diameter; it is round, lined with wood to the bottom, as all other wells. The water, on being drawn, is turbid—it was very low at the time—but clear after standing, pleasant to taste, slightly hard, runs dry in dry weather.

No. 14, Howard's Well, near the Flag-staff, constructed for the use of shipping. It is housed over, and is three 4-feet square compartments, with plank sides, and contains a large body of water. It is clear, has no smell, a slightly brackish taste. It is from 100 to 200 yards from the seashore. The Surgeon of the "Princess Chlotilde," Italian man-of-war, considered it good. The troops, in the last dry season (1870), were supplied with it, and the Medical Officer considered it tolerably good. This well takes the place of a well now closed from its proximity to a grave-yard.

No. 15 Well, in Government House grounds, has excellent water. It is a spring, just below the church, 4½ feet square, and boarded.

No. 16 Well is situated in the islet of Pappan, 200 yards from the north-east shore, beneath trees at the foot of rising ground mounting 50 feet, and covered with tall forest trees; it is 3 feet deep, and 2 feet square, with sandy clay sides; water is always running away from it; it is cloudy, bluish, a pleasant taste, no smell, a good lather with soap, contains no iron.

At Point Richardson I tasted all the waters running down to the sea, and found many fresh streams. The jungle was too dense to pursue them to their sources. They seemed like the others.

In the foregoing descriptions of wells and waters, I was at much trouble in obtaining exact information, as on a good water supply health depends. I am much indebted to Dr. Barry for his kindness in making the chemical and microscopical examinations, but the reagents to hand were insufficient. On my return to Singapore I sent Dr. Barry a small tube of terchloride of gold, with a request that he would be so kind as to endeavour to discover the absence or amount of organic matter in wells of which I gave a list. The result, if received, shall be placed in the Appendix.

When the wells run dry the Commanding Officer applies for a supply of water to the Government. In April last (1870) the troops had a supply for 14 days from No. 14 well.

I made particular inquiries as to whether the men were ever known to use water running past the barrack for drinking purposes, and found it had occasionally been used for washing-up purposes, but not for drinking.

In Barracks 4 and 5—single men's barracks—are water filters in good order, but not sufficiently used; in fact, from my own observation, I should say they were not used at all.

In Barracks 1, 2 and 3, or married men's barracks, there are no filters.

In Hospital I only found one chatty unbroken, and this unsound. As some filtration was better than none at all, I had it half filled with charcoal, &c., and the droppings caught in a tub for use.

None of the wells above described are contaminated by sewage matter, and, except well No. 5, cannot well be so, and not even this if proper supervision is exercised in future.

Food and diet. Two companies of the Ceylon Rifle Regiment, numbering 166 men, 46 women, and 81 children, left Colombo on the 17th October, 1868, in the sailing ship "Ellenborough."

On the 11th December, 1868, the troops arrived at Labuan. On landing each man received one quart of rice, if married, an additional pint. This was the whole ration, for which the sum of 2*d.* a day was paid, supplied to the troops from landing till the 1st February, 1870.

On the 22nd February, 1869, the Medical Officer in charge of the troops officially represented that the troops required a meat ration; this was not obtained until the 1st February, 1870, when half a pound of meat with bone was issued.

In the Monthly Reports for April, June, and September of 1869, special reference is made to insufficient diet as one of the causes of sickness. The men were incapable of obtaining a supply of animal food, though fresh fish was abundant; but having been accustomed in Ceylon to eat meat, variety was required, particularly after a salt diet of 55 days. To supply their natural want at first they bought small bullocks among themselves. This supply did not last long, and they could not afford to pay a higher price. When the half-pound ration was issued, difficulty in supplying first-rate quality in small quantity was experienced, and the quality was improved when the quantity was increased.

Diet and cooking. In addition to the difficulty of obtaining butchers' meat, the price for absolute necessaries was quadrupled. In Ceylon the soldiers can obtain for one cent four different kinds of vegetables and curry stuffs. In Labuan he was obliged to buy a cent's worth of each kind.

The way the messes are managed is this, each married man messes 5 or 6 single men, he receiving the ration of rice from each, buys curry stuff, vegetables, fish, or whatever was necessary, at a cost to each man daily of 4*d.* (each man's messing costing him 6*d.*). The single men at meal hours went to

the married man's room and took their meals; the wife, children, and husband * acting as servants, the remainder falling to their share.

Patients in hospital were fed in the same way except that their proportion was sent to them. Extras if ordered were also cooked, and, I believe, properly sent to the sick man. Hospital.

Such was the diet of the troops. But the convicts and local prisoners in Her Majesty's jail at Labuan received the following dietary:— Diet of the convicts.

Present Dietary (1870).		Dietary 10 years ago.	
Rice, daily	34⅔ ozs.	Rice, daily	2 lbs.
Beef, fresh, once a week ..	8 „	Beef, once a week	8 ozs.
Pork * „ „ ..	8 „	Pork, twice a week	8 „
Fresh Fish, three times a week	8 „	Fresh Fish, twice a week ..	8 „
Dried Fish, twice a week ..	4 „	Salt „ „ ..	4 „
Salt Fish, weekly	4 „	Chillies, weekly	4 „
Vegetables, daily, one cent's worth.		Black Pepper, weekly	4 „
		Tamarinds „	4 „
		Turmeric „	2 „
		Salt, weekly	4 „

The convicts, chiefly Chinamen, work hard all day in the sun making roads and ditches, but they have every night in bed.

The soldiers of this detachment are nearly all Mussulmans. As a rule Mussulmans eat more solid food, spend more money, and are very particular about their food. They eat fowl, fish, beef which one of their caste must kill, vegetables, fruits and milk, drink little spirit. The Malays, however, will use both opium and arrack. They will not eat duck and pork. They eat the fat of the animals they kill. Diet of Mussulmans.

Hindoos are less particular than Mussulmans, and will live only on rice, curd of milk, ghee, fruits, vegetables, fish, curries. They won't eat beef, but will eat pork. They drink more rum or arrack than the former class. The ration of the Sepoy in Labuan was as follows:— Diet of Hindoos.

Dietary of the Sepoy in Labuan.

Rice	1½ lbs.	Coriander	1 dram.
Dholl	3 ozs.	Pepper	2½ „
Ghee	2 „	Garlic	1 oz.
Salt	1 „	Onions	4 drams
Tamarind	2 „	Turmeric	1½ „
Chillies	6 drams	Cummin	1 „
Tobacco, weekly	1½ oz.		

Compensation for Salt Fish and Betel Nut 7 pies a-day.*

Chinamen always live well, eating anything and everything—fond of pork, fats, flour, rice, vegetables in large quantities, ducks and fowls, sweet cakes of all kinds, brandy and samshoo. Diet of Chinese.

These dietaries will be shown hereafter to exercise an important influence on diseases.

Since the half-pound of meat has been issued the troops have rallied wonderfully, and the sickness and mortality decreased. Although this ration might have been sufficient in the first instance to have preserved the men from sickness, I did not consider it was sufficient to produce recovery from debility, and therefore recommended its increase. Ration of Meat.

Before leaving Labuan, on the 16th June, the Commanding Officer was kind enough to order a parade for my inspection at 5 P.M. The men generally looked well, evidently recovering from great attenuation. The younger looked the best, the majority of the elder appeared greatly reduced, the skin hanging in wrinkled folds about the face. Some few looked sulky, but the rest hopeful. With the Commanding Officer's permission I explained the necessity for Appearance of troops on parade.

* From Dr. Cooper's Report.

cleanly order in persons, barracks, and lines, drinking good water, keeping clothes dry, value of exercise and employment, &c.

Mutinous. A very bad spirit had been evinced among the men; the Commanding Officer had very great difficulty in enforcing sanitary orders, and the condition which I have detailed above was chiefly due to this mutinous spirit. It reached

Barrack set on fire. its climax by setting on fire one of the barrack roofs. Prompt measures stayed the fire, and prevented a recurrence of any similar exhibitions of insanity.

Opium. Opium is largely smoked by both Chinese and Malays. In Ceylon the soldiers can obtain opium much cheaper than in Labuan. I cannot ascertain that much opium smoking goes on in Ceylon, but a large quantity of opium is nevertheless consumed by the soldiers. In Kandy a soldier buys about 1*s.* 6*d.* worth at a time, so the opium farmer tells me. But the quantity each person uses is very various. In Singapore many Chinamen smoke 2 dollars' worth a day; but half this quantity is the average even for an inveterate smoker both at Singapore and in Labuan. "A Chinaman can smoke half a "dollars' worth a day, and not be particularly ill with it either," says Dr. Treacher. A moderate smoker uses 10 or 20 cents' worth; 35 cents' worth weighs 130 grains. I have ascertained this exactly by filling a 35-cent box with prepared opium.

Quantity smoked.

At Singapore I bought a proper box, and had it filled with a dollar's worth of opium—it is slightly cheaper than in Labuan. In Kandy the same box filled with prepared opium costs 3*s.* At Singapore a dollar's worth of opium weighs 7 chee, and a chee is about 64 grains, or not quite an ounce in weight.

Those of the Ceylon soldiers who smoke opium do not on the average consume more than from 3 to 20 cents' worth a day. One non-commissioned officer did consume half a dollar's worth daily, but very few indeed could do that. Also very few out of 36 who died smoked opium. These soldiers learned to smoke opium during their service in Hong Kong in 1865–66, previous to that they eat or drank it.

That the above quantity of opium smoked on the average by those who did smoke is tolerably correct, as told me by themselves, I prove from the following circumstances:—1st. That no soldier can smoke more than his pay.

Amount to spend in opium. 2nd. That, like the Sepoy of old, he had no rations to sell by which to increase his pocket money, and consequently as the rates of pay of the private are daily but 11*d.* and 1*s.*, out of which he has to pay 6*d.* a day, and a monthly sum of 2*s.* 9*d.* for other matters, he could have at the very most but 11*s.* 9*d.* to spend in clothes, tobacco, opium, arrack, &c. And, therefore, supposing he spent the whole sum in opium, he could not possibly smoke more than 9 cents' worth a day. But the chances are that he did not smoke more than half that sum.

Further, had the smoking been carried on to any great extent, the officers of the detachment must sooner or later become cognizant of it, and of this the Officer Commanding assured me he knew nothing. Likewise the Medical Officer knew nothing of excess, though he was aware of the fact, and in one case (Ilulum) sanctioned its continuance, where in the case of an habitué he considered it to be rather beneficial than otherwise; certainly he did not countenance the practice, nor did he consider it more injurious than tobacco smoking.

Smoking only to a limited extent. It is, therefore, evident that the charge of opium-smoking made against the detachment, is to a limited extent, correct; but that it did not prevail to the extent it has been surmised, nor to that of injuring health.

Duties. Duties have been severe ever since the arrival of the detachment. The men have only averaged three or four nights in bed. In June 1870, they were having but one and two nights in bed.

The guards at present furnished are 1 regimental of 1 non-commissioned officer and 3 privates, increased by 3 men at night, in consequence, I presume, of the Treasury Chest being under its charge.

2 barrack guards of 1 non-commissioned officer and 3 privates.

1 jail guard reduced to 1 non-commissioned officer and 6 privates.

Since the present sickness and mortality the Governor's guard has been given up, being replaced by an orderly.

Jail. The jail, occupied by convicts, and used as a house of correction for Labuan, is situated not far from Collin Head. It occupies one of the best

positions in the island, faces the S. E., 50 feet above sea level, and 150 or 200 yards from the cliff. The ground in the front and sides is level, but behind there is a shallow ravine. A deep ditch and high brick wall of 18 or 20 feet high encloses a space of 150 by 120 feet.

Though the death-ratio for 1869 and 1870 are in excess from an ascertained cause, yet the admissions, considering the bad condition of the Ceylon Rifles on landing in Labuan, though in excess of the preceding year, are less than for the year 1867, and very little in excess of the year 1866. But they are about double of the admissions for 1864 and 1865. This is to be accounted for by the defective sanitary arrangements gradually increasing year by year in the vicinity of the barracks themselves, and not to be attributed to Victoria Plain, as has been alleged. Comparison of tables.

The difference in the numbers admitted under the term "Fevers" in late years has, I suspect, some relation to the rainfall, but as these Returns have not been carefully kept it would be premature to found any statement having reference to cause and effect; nevertheless, the following Tabular view of rainfall in relation to admissions and strength may be interesting :— Admissions to hospital increased by rain-fall.

TABLE of Rainfall, Admissions, Strength, and Temperature, for 6½ years.

Year.	Average Strength.	Admissions to Hospital.	Admissions to Hospital from Fever only.	Average range of temperature.	Rainfall, cubic inches.	Number of days rain fell.
1864..	146·8	229	98	..	106·2	154*
1865..	169·9	252	184	10·4	139·01	127
1866..	161·	446	356	11·5	139·75	152
1867..	165·2	525	455	10·4	173·	129†
1868..	154·4	302	184	10·6	127·5	none recorded
1869	160·4	498	389	9·	182·5	114‡
1870..	§133·	147	124	10·	37·6	49

It must strike any one, on glancing at this Table, that with only a diminished strength of 11, there is yet a diminution of 200 admissions in 1868. Is it to be ascribed to 45·5 cubic inches less rain? Contrast the years 1865, 1866,—is the increase of admissions due to the extra one degree increase in the average range of temperature? Beyond these queries I do not think anything can be inferred till we have increased data.

In 1865 and 1866 great fevers and mortality prevailed in the town. This arose from the refuse of fish, vegetables, and human ordure, around and beneath the dwellings of the people. The wooden houses raised two or three feet from the ground enabled the occupiers to raise a plank and deposit filth below. This arose from the old habit of living over water. This disgusting condition continued unchecked till the end of 1867. On the arrival of His Excellency the present Governor (20th November, 1867), he built a fish-market and compelled sanitary measures. Great sickness in town, in 1865 and 1866. Habits of natives. Arrival of his Excellency the Governor.

For the last 18 months the Colonial Assistant Surgeon informed me he was night and day in attendance on sick, but now he is scarcely ever sent for. Decrease of sickness.

About the same time the governors erected at the barracks latrines on the dry-earth system; the offensive condition of the hospital latrines having almost driven him from Government House.

For the year 1868 there is no report, we only find the admissions to hospital had greatly diminished. It is not to be wondered at that they increased the following year, when it is recollected that the detachment of Ceylon Rifles had been at sea on salt provisions for 55 days. On enquiry I found lime juice had been duly served out on board the "Ellenborough;" they were then overcrowded 1868. No report. Arrival of Ceylon Rifles, and the conditions suddenly forced on them.

* For 11 months (December omitted).
† For 7 months (February, March, April, May, and June, omitted).
‡ For 11 months (November omitted) § Up to 15th June.

on shore; the climate was a completely different one to that of Ceylon; they could not procure butcher's meat, which they had been accustomed to. At once they undertook severe duties, they remained in wet clothes, and lacked the nutritious food, and plenty, to which they had been accustomed. Superadded to which was a want of care and sanitary supervision. The latrines were not used by the troops, and it was not till October 1869, that the present Commanding Officer compelled their proper use by placing a sentry over them.

The following extracts from the monthly diary of the Medical Officer in charge well describe the sanitary condition of the barracks and island:—

Extracts from the Monthly Reports.

During December 1868 and the first part of January, only four barrack rooms were in use of the detachment Ceylon Rifles.

January.—General sanitary condition of barracks and stations good. Treasury guard to be done away with, as it exercises an injurious influence on the health of the troops. Recommended increase of barrack accommodation. Wells cleared out, for the water supply was bad. Filters to be procured, and a meat ration allowed.

February.—Treasury guard done away with.

March.—Sanitary condition good. Jungle cleared for some distance round the lines. Jail guard injurious because men get wet.

April.—The drainage is not sufficient for the rainfall. If the duties were lighter, and the rations better, the men would not suffer so much from fever.

May.—General sanitary condition of the station is not good, but improving year by year.

June.—Indian troops relieved had no families, consequently were not overcrowded. They were allowed a meat ration. Filters supplied. Recreation room (Barrack No. 6) handed over as a hospital. Recommended more troops should be sent.

July.—Ashes and sweepings are thrown into the ravine behind barracks; up to June they had been taken good care of and removed, but from this date this ravine is made their depository.

August.—The whole island is a swamp, and nothing is done to improve the drainage.

September.—Sanitary condition of barracks and stations not good. Drainage everywhere bad. Ague is increased by bad drainage, want of good diet, heavy duties, insufficient and bad barrack accommodation, and want of hospital room.

October.—Drainage is bad at the Lines and all over the island; and the sanitary condition is not good, because the convicts have been working at a new road instead of cutting down jungle and making drains in the neighbourhood of the Lines. The jail guard is injurious on account of night duties.

November.—Fatigues daily; ague decreasing.

December.—Recommended that fatigue parties should keep drains in order, and floor of hospital lifted up and fresh earth introduced.

1870, *January.*—Drainage improving, married quarters badly ventilated. Victoria Plain requires draining. The jail is in a low situation (close to cliff, 42 feet above sea level). Night duties produce fevers. No special prevalence of fever among the civil population.

February.—Sentries placed over latrines to compel use of dry earth.

"Malarious fevers of low type. Malarious cachexia and dropsy occurring "in constitutions weakened by repeated attacks of fever and lengthened "exposure to malaria were the most frequent diseases. Night duties and "want of earlier treatment in many cases I consider to have had a very "injurious effect."

March.—Barracks less crowded owing to death and invaliding. Ventilation unsatisfactory, drainage around barracks improving. Ravines near Lines choked with jungle. Sanitary condition unsatisfactory. On the 12th March eight patients, for change of air, sent to civil hospital. Victoria Plain not touched. No special prevalence of disease among civil population. A verbal recommendation that a portion of detachment should be sent to Coal Point or Bruni for change. This was impracticable, and detachment instead to be relieved.

April.—Convicts cut jungle, but not enough. No rain, and water is bad.

The local government have supplied pretty good water. On the 6th April the patients were withdrawn from the civil hospital. Hospital was whitewashed. No special prevalence of disease among the civil population.

May.—Sanitary condition unsatisfactory, ashes and other rubbish are thrown in heaps down the sides of the ravines. No special prevalence of disease among the civil population.

From the foregoing extracts we learn that 165 men, 46 women, and 88 children were crowded into 4 barrack-rooms estimated to accommodate 164 persons. Analysis of first part of extracts.

That the sanitary condition of the station is good. That the Treasury Guard is abolished. That in May the sanitary condition, though not good, was improving year by year. That in June the troops are too few for the duties. That in July barrack refuse is thrown into the ravine. That in August the whole station suddenly becomes a swamp, and the drainage is unattended to.

The drainage has never been reported as sufficient for the rainfall, still in a year when it was exceptionally heavy, some allowance must be made; and it is difficult to believe that the sanitary condition of the island should be improving year by year, and yet two months later the reverse condition obtain. I would prefer searching for the cause of sickness in the untidy condition instituted, in July, behind the barracks rather than ascribing it to the accidental inability of the drains to carry off surplus water as quickly as an imaginative mind might desire. Drainage.

Since, also, the drainage of the whole island has been so bad, it is singular that the civil population did not suffer—not even those living near Victoria Plain. And it is also very singular that a bad condition of the drains should affect only the soldiers, and no one else in the island, not even the wives and children of these very same men, for all were under the same conditions of climate. Victoria Plain.

That the drainage was not in fault, I think proved.

Table No. 7 contrasts, in the years 1868 and 1869, the military admissions with each other and with that of the convicts for 1869, monthly, both from ague and other causes. It there appears that for 1869, June, for both classes of sick, has the highest number of admissions; while, in the year preceding, October is the month in which most admissions occur among the military only. Most admissions to hospital in June 1869.

From a Table constructed from the carefully-kept records of the Medical Officer in charge of the detachment we find that on an average of 42·5 married men we have only 86 admissions for all diseases, out of which 64 are for malarial fevers; but on the average of 115 single men we have out of 412 admissions 325 for fevers alone. Cubic space and superficial area are in favour of the single men. Table No. 11.

Table No. 12 deduces the state of health of the women and children. Only 1 woman and 3 children die in 1869, and yet 12 men die, for all drank of the same wells, hence the water of the barrack-yard could not have caused the large death-rate. Health of women and children.

In Table No. 13 we shall find an account of the number of attacks of ague. Among those who died in the year 1869 up to the 15th June, 1870, out of 36 men there are 24 who had had ague from 1 to 13 times before arrival in Labuan, and that in those 86 attacks of ague the number of days' sickness for each ague attack was, on the average, 6·5, which length of time nearly coincides with the average 7·1 for the year 1869, showing that the treatment for ordinary cases of fever in Labuan, as compared with other stations where life was not involved, was the same. But for all those who died, whether from fever or other causes, in 18 months, the average ague sick-rate rises to 12·9 in those who had had previous attacks, but only to 10·6 in those who had not been previously attacked. This shows that the type of malarial poisoning in Labuan is not of a virulent kind, yet the total average days' ague sick for all who died, whether from fever or some other cause, is 12·1. This appears to point to some special cause for the extra length of time each ague case was under treatment in Labuan as compared with other stations. Table No. 13.

In the foregoing Table (No. 13) it will be observed that one man never had ague, and three more no fever in Labuan.

Six died from causes not in any way directly connected with ague,—rheumatism, anæmia, dropsy, and dysentery being looked on as effects more or less of the special cause of mortality or climate.

Influence of age on the mortality.

It is reasonable, therefore, to suppose that age may have had something to do with the death-rate, accordingly I have constructed the following tabular statement of original numbers in each quinquennial period, the deaths for each year, cause, married or single indicated by letter M:—

RETURN of mortality in each quinquennial period.

		Under 20.	Between 20 and 24.	Between 25 and 29.	Between 30 and 34.	Between 35 and 39.	Over 40.	Totals.
Original Number		21	45	23	16	16	44	165
Total Deaths		5	9	8	4	8	2	36
1869	Died from Ague.. ..	1	0	2*	0	2	1†	6
	Died from other causes..	2	1	1	1†	1†	0	6
1870	Died of Ague	2	6	3	0	5‡	1†	17
	Died from other causes..	0	2	2	3†	0	0	7

* 1 Married. † Married. ‡ 4 Married.

The above table shows mortality was evenly distributed in 1869, the special cause acting equally on all ages. But in 1870 the chief sufferers are between the ages of 20 and 24 years. Out of 89 men under 30 years we have 22 deaths, and one man married; but out of 76 men we have only 14 deaths, of which 12 occur between the ages of 30 and 40, of whom 9 were married, while above 40 years 2 deaths, both married. In the year 1869, up to 30 years, 3 deaths occurred from malarial poisoning; but in 1870, 11 deaths. Out of all who died for the year 1869, there were 4 married (2 from ague); and for 1870, 8 married men (5 from ague).

Mortality of married and single.

Thus, then, among the single men 24 deaths, 16 from direct malarial poisoning; and among the married 12 deaths, 7 being from the same cause.

For all diseases the death rate to the married men is 4·6 per cent., while to the single it is only 1·9 per cent. For ague only the death rate is 3·1, and 1·2 for each class respectively, for admissions to hospital, in 1869. The single men, therefore, were admitted to hospital more frequently, but their death rate was lower.

We have for the year 1870 no distribution return, so that we cannot go on with the comparison; but we have learned that for men under 30 years the death percentage was 24·7; for those over 30 it was 18·4 per cent.; and of this 14·4 per cent. was for married men.

Out of the 12 married men dead, 10 had been attacked with ague before arrival at Labuan; 2 others, old soldiers, had no admissions to hospital recorded against them; one was 49, the other 34; both died in 1870.

Since, then, the mortality among the single men was 20 per cent., and among the married 26 per cent., it is clear that, whatever exceptional immunity age, wisdom, and sober habits of life might be supposed to give in resisting the debilitating influences of repeated attacks of malaria, none was extended to this Detachment, and the married man fared worse than the single. There must, therefore, be some other cause than mere poison of malaria to account for this.

From the Medical History Sheets of 88 survivors, I ascertained—

65 had ague before arrival in Labuan.
18 had ague in Labuan for the first time.
5 never had ague at all.

Living.	Dead.	Total.	Remarks.
65	24	89	Ague before arrival.
18	11	29	Ague for first time.
5	1	6	Never had Ague, or no record.
88	36	124	
Transferred in 1869 and 1870		43	Of whom no account.
		167	

This is even sufficient to show that out of 165 men arriving in Labuan in 1868, and two enlistments, malaria does not prevail to the extent it has been supposed; or else why out of 88 survivors, after 18 months' residence on the island, should we have five who had not suffered?

Again, in Table No. 13, we find 24 men with 86 attacks, averaging 3·5 attacks each, and 6·5 days in hospital, yet after their arrival they only averaged three attacks each, with a nearly double number of days sickness (12·9).

Again, of the 11 men first attacked, we find 39 attacks with an average of 3·5 to each and 10·6 days' sickness. This, I think, tends to prove that previous attacks may in some way alter the constitution to enable the body to resist the baneful influence which produces paroxysmal fevers; a safer reason is, perhaps, that the sufferer instinctively avoids certain localities and acts which he knows to be injurious, and of which the novice is ignorant.

Again, of the whole 36 to other stations, we have 3·5 attacks and 6·5 days sickness. To Labuan, in 1869, three attacks and 11 days' sickness to each, and in 1870 1·3 attacks and 16·6 days' sickness, showing a progressive increase in length of time in hospital for a diminished number of attacks of paroxysmal fever. But for the year 1869, convicts and soldiers average 4·8 and 7·2 days each respectively. That is, convicts stay in hospital not quite a third less time than the military; while for those of the latter who died, the time is nearly doubled, but, compared with other stations, is only a half per cent. greater.

In 1869, in Labuan, of those of the 24 who died, each man remained sick 12·6 days for one attack of ague. Of the 11 who died, the days' sickness for one attack was only 7·6; that is for the period of one year. The average for both classes being but 11 days.

In 1870, the 24 average 14·4 days' sickness; and the 11 average 19·4 days for each attack in hospital.

In 1869, the number of attacks to each one of the 24 was 2·9, and in 1870, 1·3; for the 11 the number was 3·2, and in 1870, 1·2.

It would from this appear that those previously attacked were not so well off as those attacked for the first time in 1869; but in 1870 the condition is reversed, showing "diminished evolution of vital force"; and as the attacks of ague have decreased in number, we must have some other factor at work besides malaria to account for this lengthened detention in hospital; and 9 out of the 11 who were first attacked in Labuan were under 30 years of age.

We have seen that the greatest number of deaths occurred under 30 years of age—viz., 22 out of 36; this is to be accounted for by recollecting that the growth of the body is not completed till between 25 and 30 years of age. Of the 22 who died under 30, the majority were under 28, 1 was 28, and 2 were 29 years of age; and, as in 1870, the greater number died between 20 and 24 years of age. It would appear that their bodies were not capable of resisting the exhausting discharges consequent on a slight attack of ague. It must have been admitted that their diet was not sufficient—that is, the diet to all the troops was insufficient, and, therefore, to these men in particular was totally insufficient, for they had to build up or complete the growth of the body, besides withstanding the enormous disintegration of tissue, which it is well known occurs in every feverish attack.

Therefore, in the case of the men under 30, the absence of a nutritious diet was double in its effect to that on the elderly or more mature. In

the elderly the body had been built up, and had to maintain itself by its own inherent vitality, for nutriment in this class was exclusively applied to the wear and tear of tissues: whereas in the young, it did not counterbalance the wear and tear of the tissues—the body was still building; and "mortality may be expected to keep pace with, and be a measure of, the "liability of the vital organs to fall into a state of disease, and to increase "as the restorative power diminishes." And there is reason to believe that the inhabitants of damp soils and low-lying districts have less vigor than those of hills and mountains. Now, "if it can be proved that almost every disease "originates in one or other of two ways, either loss of vitality or interruption "of function," we have here both causes conjoined—"loss of vitality" arising from defective diet and excessive moisture, with "interruption of function" in the restoration, "sleep."

To meet, therefore, the calls on the system required by nature in building the body, maintaining its tissue waste in cases of sickness, such a dietary should be adopted as will furnish within the shortest time the power of evolving "vital force." Hence, in Labuan, since fish was the only animal food—fowls, beef, &c., from their price being unattainable—the issue of a ration of beef is imperative.

In the remarks on diet I showed how the married men messed the single. That is, the married men had to go to the town daily (a distance of about four miles there and back) to buy food, other than the rice provided at the barracks. The married men were not exempted from duty, and, with others, had less than three or four nights in bed. This daily walk was an additional loss of tissue, for it entailed increased exposure to the weather, whether fair or wet, and involved a still greater loss of repose. I have also shown that butcher's meat was not procurable, and that an unvaried diet is harmful, because it begets disgust to the stomach.

Married men's mode of life.

Now, when it is reflected that the married men did not lead the indolent way of life the single men, perhaps, indulged in, but were compelled to be active for the good of their noisy families and and the single men; that they did not go into hospital so frequently for attacks of ague—though in deaths they are 7 out of 23—it must be admitted that this death-rate could not have arisen from the malaria which they imbibed, but from some causes which gave that malaria an exceptional hold on them. They were—poor food, and also probably less, more labour, more anxiety and less repose, for the married barrack-room must be, more or less, in one continual uproar.

Single men's mode of life.

On the other hand the single men had as much food, of its kind, as they could take—no trouble in obtaining or cooking it, no anxiety about what it cost, no family to care for—a distinct sum of money, the same as the married men, to provide them their luxuries, more repose. They felt hot and feverish, and went to hospital. But unless the married man was, say, for duty, the chances are that if he felt hot and feverish the duties to his state compelled him to walk the feeling off.

Women and children's mode of life.

On the other hand again are the women and children. We may at once say they did not die from malaria. Why is this? because they had little household duties which kept them out of the wet, the sun, the chilly night air, with every night in bed; yet they drank of the barrack-yard wells and eat with their husbands and fathers the remains of the single mens' repast. The N. W. and S. E. sea and land breezes, and N. E. and S. W. monsoons, swept past their habitations wafting little eddies of malarious poison, if there was any, through the crevices and holes of the barrack floors. But these beings died not, were able to subsist, and live out their "heads."

Water probable cause of poisoning.

The above contrast clearly proves that locality and water about barracks did not cause the death-rate. We have seen that the men on jail guard used well No. 12 outside the jail; it was pleasant to taste, and clean (No. 14 jail well was muddy on being drawn), but that a brownish-coloured road-stream passed around it. This well, I think, most probably was tainted with more organic matter, or malarious ingredients undergoing change, or rather which had not undergone change, than its pleasant taste would lead any one to suspect. An officer at Singapore on a shooting excursion among the hills at Malacca told me, he found the mountain stream so clear, good, and pleasant to the taste that he and his party drank freely of it. They had all been

perfectly well before, but afterwards every one was attacked with fever. He accounted for its insalubrity by, in its descent, crossing over or washing decayed and decaying trees, thus taking up organic matter. There is no mistake in this example, for my informant is a man of observation and scientific attainments and not likely to have made any mistake, and I satisfied myself at the time that there was none. Why a mountain stream may be impure.

The ultimate products of animal and vegetable decay are carbonic acid, water, and ammonia; but how these combine to form malaria is not yet known, or whether, indeed, animal and vegetable matters decaying have got to this stage when they are taken up by water, and on entering the body there complete the natural change, and in doing so thus became baneful to the animal system, is not known either. But, from the instance above, as a clear and mountainous may be deleterious, how much more the water of this roadside well that had been washing past vegetable particles in decay. Theoretical view of source of malaria.

I think, then, it is probable that, whatever malarial fever the guard contracted in the neighbourhood of the jail was from using this water.

But imbibition of this water may not have caused sickness; and it is possible, and most highly probable, that, since cold, damp, privation of food and rest, improper diet, and excesses of any kind, will reproduce disease; and that, as 89 persons out of 124 had had the germs that produced paroxysmal disease, those persons coming sick off jail guard oftener than other duty should complain that this particular duty induced an attack of ague, the wet clothes and water of well No. 12 not being taken into account. If then, the number of attacks a patient undergoes, supposing he is fairly cured of each attack, is a measure of the intensity of, or universality of, a malarial atmosphere, Table No. 13 informs us that on other stations attacks of ague were 3·5 for each one of 24; but, in 1869, for Labuan they were only 3 for every one of 29 men, and 1·3 for every one of 10 men in 1870. Hence, for Labuan, attacks of ague are progressively less the longer the stay; and this accords with the opinion of Dr. Cooper, and the present Colonial Surgeon. We are thus driven to one of two conclusions, either that Labuan is or is not intensely malarious; or, that the human body, exposed to malarious atmosphere, becomes in some way protected. By statistics of convicts, police, and civil hospital, I have endeavoured to show that it is not intensely malarious, the same also by the progressive decrease of admissions for attacks of ague among the soldiers. I have also endeavoured to show that previous attacks confer no immunity from subsequent attacks; and that in Labuan the human body is not protected in any way from the reception of miasm. Previous attacks may influence Sick Rate. Labuan is not more malarious than other stations.

On looking again at Table No. 6, we find that in November 1868, one month before the arrival of the Detachment Ceylon Rifles, 50 convicts arrived from Singapore, and that up to the 15th June, 1870, more than 18 months after, only 3 men out of an average of 132 had died, and yet in this time 36 soldiers had died, and 38 been invalided, of whom 6 died within 20 days of leaving Labuan. Contrast between arrival of military and convicts, with reference to length of residence.

I therefore conclude that length of residence *per se* will not account for the mortality.

The total number of deaths over 40 years of age is two; therefore old age cannot be a cause. Old age not a cause of mortality.

Opium smoking to excess has been proved impossible. On this point Dr. Treacher has said:—"that the Malays, using opium on their first arrival, "might, by its injurious and depressing tendency, have done themselves harm "which would not have been the case had they been addicted to spirits." He further says that after 20 years experience he never saw a drunkard die of fever in Labuan; and that "for the sick the most important remedial "measures were wine and meat."

After extensive experience in the Malay Archipelago, Dr. Anderson of Singapore says the same.

I myself, after three years experience in China, confirmed by the Chinese themselves, never saw ill effects from opium smoking, so long as the smoker took his food well and in sufficient quantity.

And as we have no information from any source that the Malays of the Ceylon Rifles were addicted to spirit-drinking, they cannot be accused of excess either in opium-smoking or spirit-drinking, to account for the unusual mortality among them. Opium and spirit-drinking not a cause of the mortality.

It has been shown that Mussulmans are a particular class of religionists in the food they use, and would rather die than eat what they consider unclean. As an instance of this we have Dr. Barry's statement that in hospital they spit out beef tea when given to them. From the records and statement of Dr. Barry it appears that he used every endeavour to discover their cause of death, and he also appears to have treated them efficiently for the symptoms they discovered, acting equally on the advice and assistance of others as of his own knowledge, and that he adopted the only means in his power to save them —"removal to another climate." In this he is borne out by the extensive experience of Dr. Anderson, of Singapore. This, however, alludes to the particular form, or rather collection, of symptoms which the majority of the men who died in 1870 at Labuan exhibited; but not to the cause of that collection of symptoms which in this long report I have endeavoured to elucidate by the process of elimination.

Attention of Medical Officer to ascertain cause of mortality.

Sanitary condition of Coal Point.

The sanitary condition of Coal Point deserves a few words to complete the chain of evidence as regards sickness and mortality.

Mr. Lumsden, the manager, has been resident there 2 years, and says very little sickness occurs among the Europeans and natives at work in and about the mines. He himself (last year) contracted paroxysmal disease at Saigon, and did not begin to recover till his return to Coal Point. During these two years only one European died, chiefly from the man's own carelessness, of epistaxis, and one native in May 1870 of enlarged spleen. There are at present about 30 Europeans employed there, and the only men sick are those who drink, this the men acknowledge themselves, saying, "if they let the drink "alone their health would be as good as it is in England." On the 7th June, 1870, an itinerant lecturer addressed these 30 people on "moderation in drink"; at the conclusion each man rose and condemned the lecturer's opinions in favour of his own experience.

Health of Europeans good.

The men at Coal Point are well fed by the Manager, with due attention to change in diet, vegetables, bread, beef, fowls, &c. The men also are well contented, and work as hard as they do in England; they never grumble or want to go home. The married portion remit very large sums to their families at home.

Besides the want of a good animal diet in Labuan, there were some other causes in operation of a moral kind which may have, to some extent, influenced the death rate in 1870.

Moral predisposing causes.

One of these was want of confidence in their Medical Officer, and their absolute refusal to attend to his directions; and this arose from the dispirited condition to which they had been reduced; and if they were ready to attribute to him want of skill through any improper ideas of their own or suggestions of others, he was no less ready to search for some other cause than the one he had originally pointed out, and most strongly and repeatedly urged, yet in some unaccountable way to have deemed insufficient for the fatal results which ensued. That cause was the want of a better diet. In that opinion I have endeavoured to prove he was right, and that no other cause independently of that would have produced the mortality.

Another moral cause predisposing to sickness is to be found in the natural indolence of the Malays as a race, and their superstitious notions.

The Officer Commanding the troops informed me of the difficulty he had in getting anything like active work out of the men on fatigue; and I myself was a witness of his activity and their inactivity. Something, however, must be ascribed to weariness from loss of rest, and depression both in body and mind; still, as a race they are indolent.

Other causes were nostalgia and dread of climate, in consequence of the large rainfall; over-crowding, and general want of comfort, combined with the dearness of provisions. On this point I have compared the prices of provisions at Kandy with those at Labuan, and I find that some articles are the same price, but others, the most important, are not only very considerably cheaper, but in greater variety at Kandy than in Labuan. They had no rations to sell, as the Sepoys were not separated from their families. If then a meat ration, by Dr. Cooper, was considered necessary for the Sepoy, it was still more necessary for the Malay, whose ration consisted only of one quart of rice, with the inconvenience of having to obtain all other necessaries at a daily cost of near 70·68 tons additional labour and greater cost.

Price of food.

Meat ration judged necessary for the Sepoy.

As an illustration of the value of animal food on one of these very men— anasarcous—this patient married, returned with me to Ceylon. On board the barque "Samson" he had the dietary given at page 48. I made him bathe daily, and for 10 days he got on well; before coming on board he had been receiving a beef ration, this of course was stopped. I found at the end of this time he was becoming more anasarcous, he had a coppery hue and a shrivelled aspect in some parts and puffed about the face; the eye had lost its brilliancy. The captain very kindly allowed him a fowl to kill, and some claret. In two days the man was an altered being; I never in my life saw so striking an alteration. It certainly was not the claret for I don't think he drank it. I landed him at Singapore as well as when he left Labuan. He was thus 10 days without any ration of meat, except what he might have bought, and he was poor and married. He went on board the P. and O. steamer, œdematous, bronzed and inactive, as he appeared before. I again witnessed the marvellous effect of a little fresh animal food (beef), but then he got no claret, proving that beef or fresh animal food was the restorative. Value of fresh animal food.

If, then, so much benefit can accrue to a case of disease (originating in the want of animal food, or, we will say, an improper and innutritious diet) from the supply of a small amount of animal food, it appears to me clear that the earlier issue of a meat ration might have prevented the mortality, for the symptoms of anasarca would not have appeared. And this appearance was due to the effects of cold and wet in going on guard, and insufficient repose, or nights in bed. The nervous system having become at last exhausted with the repeated calls on its sustaining power, took rest for itself. Sympathetic influence was lost, and the vessels in and about the spinal cord became filled and over-filled, till at last they were quite incapable of emptying themselves. In this way I account for the anasarca and subsequent death. Theoretical reasons why want of fresh animal food was a cause of the death-rate.

That the above is the true cause I believe; and I hope I have had some sufficient ground for arriving at such a conclusion, and that I have had such ground I contend for the following reasons:—

In a period of 15 years there were 14 deaths from beri-beri and dropsy, and 12 from atrophy, or nearly one-third of all the deaths occurring during these years; and we know that Dr. Cooper stated a meat ration was advisable —he had had nine years' experience of the climate—that the troops sold their rations because they were so good, and from our cupidity to serve their families; that it had an injurious effect has been seen; their walk to the town of four miles (there and back) was not one of necessity, but of pleasure and profit, for a "something to look forward to:" exposure to heat, wet, or cold was not a necessity to life, but an object for living. But for the Malay this was a constant source of wear and tear: sick or well, heat, rain, or cold. he had nothing to look forward to, not even quiet repose. So, then, in both classes of natives we have death from exactly the same cause—mal-nutrition. Beri-beri.

The term beri-beri is used for a collection of symptoms having their seat in the nervous centres, caused by mal-nutrition, and directly expressed by the actinic rays of the sun. Dr. Aitken says it it a constitutional disease, expressed by anæmia, culminating in acute œdema.

Looking over the Army Medical Reports for 1867, we find that the Ceylon Rifles in Hong Kong were troubled with anasarca; it was attributed to their mode of living, and that the Hindoo portion died. In the year 1868 we find a similar entry. Since then we have seen that the Malays in Labuan were under a condition forced for them which was natural to the Tamils, and as the remedy for the Tamils was animal food (mutton, which they could not obtain), and because they could not obtain it the medical officer was driven to conclude they were not adapted for service in Hong Kong; therefore, no more can the Malays be adapted for service in Labuan, for under similar dietaries each race became anasarcous. Army Reports.

In Dr. Aitken's "Practice of Medicine," we find that Mussulmans are said to be more prone to this form of complaint than others. From the above paragraph we conclude that anasarcous disease prevails in that race wherein there is the least change of diet, whether natural or forced, and therefore that Mussulmans are not, except from accidental circumstances, more prone than others to this affection. Further consideration of this subject I reserve for the account of the case of post mortem I obtained in Labuan.

It has also been shown that the convicts did not suffer in any very remarkable manner from fever, though exposed to all the influences supposed to be injurious to the troops. But it is not to be forgotten that they had a good dietary, and *every night in bed.*

It has also been shown that the civil community at large did not partake of the sickness of the soldiers, nor do we find any undue mortality either among the inmates of the civil hospital or community at large, whose death-rate we have endeavoured to show was not greater than 5 per cent., but then, they had *every night in bed.*

It has also been shown that sickness and mortality at Coal Point are not in any undue proportion, and that any sickness is chiefly from excessive indulgence in spirits, and which may happen at any colliery in England as well as Labuan: but then, they had a *proper proportion of rest.*

It has also been shown that persons living under the same roof as the men who died—who drank of the same well, and eat of the same pot, who lived, in short, under the self-same conditions in all respects—remained alive and well at the end of the same period of time; but then, *they had every night in bed.*

Having shown that mortality keeps pace with, and is a measure of, the liability of the vital organs to fall into a state of disease and to increase as the restorative power diminishes; we are now in a condition to assert that this was the case among the soldiers in Labuan. It has been previously shown that loss of vitality or the power of generating nerve force was in abeyance, in consequence of defective diet and damp, and that the nervous system could no longer respond to the calls made on it.

The ganglionic, or sympathetic system, failed first, when all the other train of phenomena ensued. Just as "if a handful of gravel be thrown among the "cranks of a steam engine, the motion is impeded and becomes irregular. "This is what takes place in diseases caused by impurity in the articles used "as human food. When the food is deficient in quantity or nutriment, a loss "of power is the result, with its attendant irregularity in consequence."

Conclusion. Since then, "the whole art of curing disease consists in increasing the "working power of the human machine, and preserving the equability and "regularity of its action," we are compelled to conclude that as the convicts and Coal Point people worked hard and had good diet and every night in bed, and did not fall into any unusual state of disease; and that as the civil community and women and children had every night in bed and did not fall into any unusual state of disease, that neither would the soldiers have fallen into any unusual state of disease had they enjoyed a greater number of nights in bed; but, that on the contrary, we may fairly infer that a better diet would have supported them under the duties of fatigue, and in some measure compensated them for wear and tear of tissues and loss of rest, both which their wives and children enjoyed on the same diet but with every night in bed. Thus then we see that a better diet would or might have prevented a large number of admissions to hospital, and in this way given nature's restorative, sleep, to the overtaxed nervous system; and, by in this way increasing the restorative power have lessened the mortality.

It is well known that natives can undergo a great amount of exertion on a very small amount of food, and keep in perfect health provided they get their quantum of rest; but if harrassed lose spirit and die. And as the nervous system is the sustaining power of the animal frame, it, like other tissues, requires rest.

This loss of rest in increasing the admissions to hospitsl was well exemplified some years ago in Hong Kong among the European soldiers, who had not more than three or four nights in bed. I suggested a midnight meal for the men on guard, which was ultimately given; but the much more important restorative being also granted the sick list decreased.

Having thus traced the cause of the mortality to insufficient food and rest, I have no more to add except on the next subject—Sanitaria.

Sanitaria. Pappan suitable. The only eligible place for a sanitarium appears to be the islet of Pappan—it is oval and well wooded. The central part, cleared in its short diameter, is 50 feet above the sea-level. There is a mangrove fringe around, and at high-water good bathing under shade on the southern shore. The eastern end contains some fine forest trees on undulating ground. There is also a spring

of good water, said never to run dry. On the island earth-oil or petroleum is also to be found, and, as I noticed white-ant-heaps, it will be needful in building a house for the sick for smearing the timber. It has no inhabitants.

Point Hamilton not suitable.

Point Hamilton is well cleared, but it is private property, and not therefore available, and I should not think it a desirable place for sick if it could be obtained.

Coal Point not suitable.

In February last, when the troops were so sickly, Coal Point was suggested as a sanitarium, and there was a building which might have been secured, but it was deemed impracticable to send the troops. The Manager of the Coal Company offered to lend ground for a shed or house, and His Excellency the Governor was willing to build, but I proferred the islet of Pappan as a sanitarium. In the years 1860 and 1865 one had been made of Coal Point, and with benefit to the troops.

Bruni no suitable.

On the 9th March, Dr. Barry officially recommended, with the concurrence of Dr. Treacher, the Colonial Surgeon, that some 20 or 30 men should be sent to Bruni, and His Excellency the Governor was prepared to give up the Consulate for their use. This the Officer Commanding did not consider an advisable measure.

Collin Head a good position.

The house, at present used by the gaoler, near Collin's Head, some years ago was built for a sanitarium. Its proximity to a burial ground made it then unpopular, and it would be so still if it could be obtained. We have, however, seen that there was a little change for some of the men to the civil hospital in this neighbourhood. On the whole, this is an advisable situation, but I give the preference to the island of Pappan.

Pappan preferable.

I searched all the coast from Hamilton Point to Point Richardson, but found no available place. The jungle was so dense I could not penetrate it. The shore generally was fringed with mangrove trees. At the mouth of the river Saguma is Kini Banuwa, a village on piles, and others in several other places. One near Point Richardson is close to the "Fish Takes," which supply the market of Labuan, I could just row around this, the tide being out.

Southern shore not suitable.

Pile villages.

These pile villages forcibly reminded me of the Irish and Swiss lake dwellings in the past, and of this object, which I was thus enabled satisfactorily to explain, not protection from wild animals or hostile tribes so much as for protection from injurious terrestrial emanations, our ancestors even recognising the necessity of not building their houses close on the ground, and also for an easy method of ridding themselves of much refuse.

Philosophy of ancestors.

Burong.

Finding no place on the western shore of Labuan, I turned to Burong Islet, and found it a mass of lava rock, difficult and dangerous to scramble over. A small amount of coral formation, deposited before its present elevation, covers to some extent its surface to the disintegration, of this I imagine is due the means whereby it has such a magnificent cluster of tall forest trees.

Pappan.

It would appear then that the islet of Pappan is the only available place for a sanitarium. The isles of Kuraman and Great and Little Rusukan being private property.

I enclose a plan of an octagonal wooden structure proposed by the Surveyor-General to be erected as a sanitarium on Pappan. The plan seemed to me to be good. It is to be raised 6 feet from the ground, and I imagine a number of such structures might be very cheaply constructed and made available for any person.

During my stay in the island of Labuan I made verbally, and in the majority reduced to writing, the following recommendations, which I trust will be found both feasible and practical, and of advantage both to troops stationed there and the islanders generally.

They are as follow—

Recommendations.

That all accumulations of rubbish, whether at the coal mines or other parts of the island, should be systematically levelled ; and all decaying timber, dead leaves, grass, or brushwood, periodically collected into heaps and burnt, whether on public or private property.

That in the case of all wells known to become dry at certain seasons of the year it would be advisable to discontinue the present wooden sides and substitute brick, because when the wood becomes exposed to atmospheric action, miasmatic matter is likely to be formed and become a hidden source of poisoning. To obviate this as far as possible I recommended wooden or iron cages

filled with charcoal to be lowered into wells in use, and to be renewed three times a month by re-burning, drying in the sun, or freshly prepared charcoal.

That in order to improve the quality of the grazing land in the island, it would be advisable to enclose the land and turn cattle therein. And that in the neighbourhood of Victoria Plain, where drainage might be difficult from the low nature of the ground, that a large central pond should be dug, drains on all sides flowing into it, having a twofold advantage, first, to get rid of surface superfluity, and, secondly, as a water store for cattle to drink and bathe in. And that on certain land to sprinkle quicklime so as to neutralize the undue amount of tannic acid generated in certain soils by a large rainfall.

That if a sluice were applied to the main entrance of water with the tidal drains in and about the plains of Victoria, that the drain might be kept full or empty at pleasure with fresh or salt water, and so avoid the unpleasant smell which arises at ebb-tide, thought by some persons to be inimical to health, and that after a time the land now destroyed through crabs might be recovered and turned into good grazing land.

That in the event of increased hospital accommodation being required, it would be advisable to add a storey to the present hospital.

That the ventilation of the barrack-rooms should be improved by open venetian windows, 8 feet from the floor.

That the barrack-floors should be mended—in fact caulked.

That it would be very desirable to have fruit and other trees planted near the parade ground, and thus not only to form a belt against possible malaria, but to absorb deep surface water; at the same time the land was being improved by cattle, and that the whole lines around the edge of the ravine might be defined by a quickly-growing hedge, both, at the same time, as a means of intercepting malaria, if any, and to prevent out of sight accumulations.

That the guard on wet days should march barefoot to the jail, and wait till the heaviest showers were over.

That the men in spare hours should be employed in doing something useful about their quarters—building more accommodation, cutting and bringing timber from the forest. In fact, that they should be made use of and kept in Labuan as a means of protection to the island, and not as a source of employment to the convicts, whom they are to guard.

Dr. Barry, on the 9th March, instituted bathing parades, and he remarked that it did the men much good; the good it achieved was a change in the direction of thought, for they were dispirited grumblers.

That the hospital serjeants' quarters should be more favourably placed, and the cooking-houses also more conveniently placed.

That great attention should be paid to the condition of the filters in barracks and hospital, and the charcoal regularly restored, and a few rusty nails placed in each water-chatty.

That the latrines should be whitewashed twice a month and their floors scrubbed with soap and sand once a week or oftener. In short, that the most absolute and thorough cleanliness in the persons and habitations, and about them, should be systematically enforced.

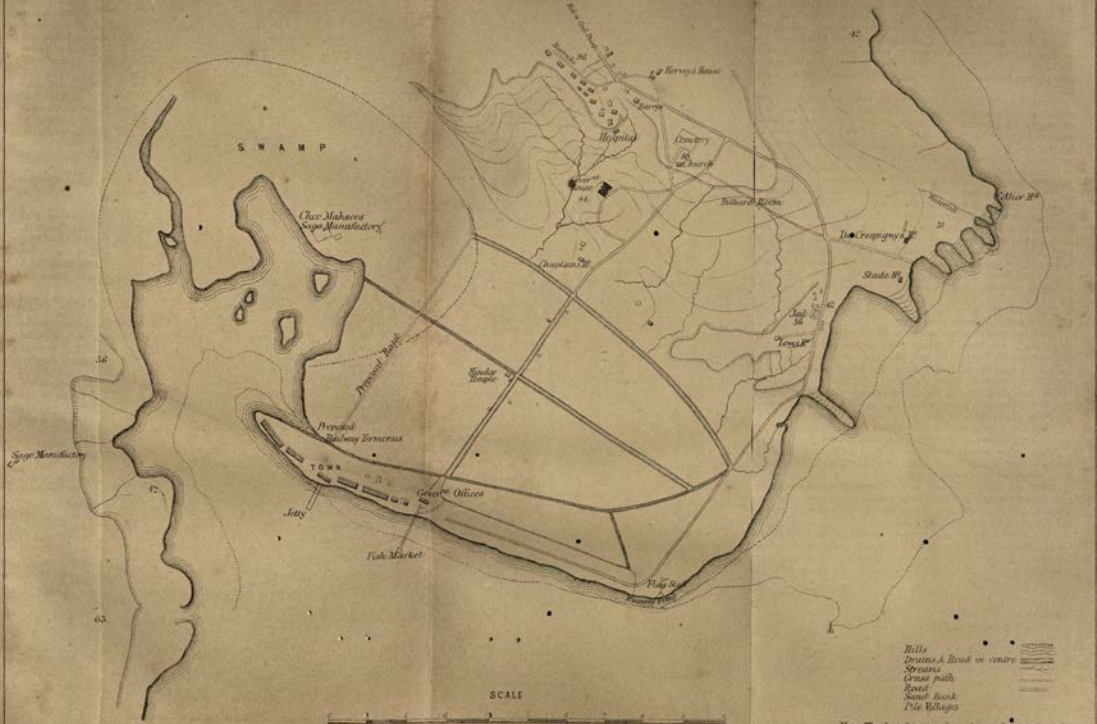
That meteorological observations should be carefully attended to.

In conclusion, I can only add that from all officials in the Government of Labuan I received every courtesy and assistance, particularly from his Excellency the Governor, the Surveyor-General, and Assistant Colonial Surgeon.

CHARLES MOORE JESSOP,
Staff Surgeon.

Kandy,
14*th September*, 1870.

PLAN OF VICTORIA, LABUAN.



ANALYSIS of Water at Labuan, by Terchloride of Gold, for the amount of Organic matter.

Well No. 1. A considerable quantity.
" 2. A trace.
" 3. A small quantity.
" 4. A considerable quantity.
" 5. A considerable quantity.
" 6. A small quantity.
" 10. A small quantity.
" 11. A small quantity.
" 13. A considerable quantity.
" 14. A considerable quantity.

By a small quantity I mean a few grains of dark powder, after boiling for some time.

A considerable quantity means, all the water getting very dark coloured, with some 60 or 70 grains of the dark powder at the bottom.

A trace means, the water getting slightly dark coloured.

J. BARRY, M.D., Assistant-Surgeon,
Ceylon Rifle Regiment.

A TABLE contrasting the Meteorology of Kandy with that of Labuan for similar periods, page 21.

Year.	Mean Highest Temperature.	Mean Lowest Temperature.	Mean of Highest and Lowest.	Mean Range of Temperature.	Average Rainy Days per Month.	Average Monthly Rainfall.
1865	89·6	65·8	77·8	23·8	..	..
1866	89·6	64·6	77·0	24·7	..	..
1867	83·7	64·7	73·9	19·7	12·8	5·1
1868	91·5	64·2	77·9	28·0	9·9	5·5
1869	90·7	64·6	77·7	25·0	14·6	6·4
1870	92·8	62·8	77·9	29·7	8·6	4·6
Totals	537·9	386·7	462·2	150·9	45·9	21·6
Averages	87·3	64·4	77·0	25·1	11·4	5·4
Labuan averages ..	87·1	76·7	81·9	10·3	12 6	11·52

Analysis of 36 Medical History Sheets of Men who Died in Labuan.

No.	Age.	All other Stations.		Labuan.				1869. 1870.	Causes of Death and length of time ill of those who did not Die of Malaria directly.
				1869.		1870.			
		Attacks of Ague.	No. of Days Sick.	Attacks of Ague.	No. of Days Sick.	Attacks of Ague	No. of Days Sick.	Total Days in Labuan	
1	20	1	3	3	83	...	...	83	
2	26	1	4	4	88	...	...	88	
3	22	1	5	1	9	...	...	9	Phlegmon, 31 days.
4	M. 37	1	5	2	12	1	26	38	
5	M. 28	1	10	3	24	...	...	24	
6	17	1	13	6	78	...	...	78	
7	19	2	10	6	38	1	4	42	Remittent Fever.
8	26	2	11	3	56	...	...	56	Anasarca, 10 days.
9	M. 34	2	12	1	7	...	...	7	Bronchitis, 39 days.
10	M. 36	2	13	...	...	1	11	11	
11	M. 34	2	16	...	...	...	...	...	Anasarca, 14 days.
12	M. 39	3	14	...	...	...	...	...	Dysentery, 30 days.
13	26	3	17	...	...	...	...	...	Bronchitis, 28 days.
14	39	3	31	2	65	...	...	65	
15	35	3	40	1	15	1	3	18	Remittent Fever.
16	29	4	21	1	8	1	16	24	
17	37	4	23	2	21	...	...	21	
18	19	4	33	8	51	...	...	51	Rheu., Chronic, 14 days.
19	21	4	41	4	32	2	17	49	Remittent Fever.
20	M. 41	5	26	1	5	...	...	5	Remittent Fever.
21	M. 31	5	27	3	32	...	...	32	Rheu., Acute, 11 days.
22	M. 37	8	61	2	51	1	25	76	
23	37	11	62	4	49	3	39	88	
24	M. 37	13	68	2	22	1	32	54	
	Total ...	86	566	59	746	12	173	919	
	Average	3·5	6·5	2·9	12·6	1·3	14·4	12·9	
25	18	...	...	...	...	...	...	...	Scrofula, 59 days.
26	20	...	...	1	4	1	16	20	
27	21	...	...	2	10	1	36	46	
28	24	...	...	2	12	...	...	12	Anæmia, 17 days.
29	19	...	...	2	13	1	8	21	
30	26	...	...	2	16	...	...	16	Bronchitis, 20 days.
31	M. 34	...	...	3	11	1	10	21	Anasarca, 10 days.
32	21	...	...	4	32	2	17	49	
33	26	...	...	5	42	2	74	116	
34	20	...	...	8	83	...	...	83	Anæmia, 9 days.
35	23	...	...	...	...	1	4	4	Remittent Fever.
36	M. 49	...	...	...	...	1	29	29	
	Total ...	...	...	39	423	16	194	417	
	Average	...	...	3·2	7·6	1·2	19·4	10·6	
	Grand Total ...	86	566	88	969	22	367	1336	
	Grand Average	3·5	6·5	3·	11·	1·3	16·6	12·1	

RETURN of Women and Children of Ceylon Rifle Regiment at Labuan.

Months.	1869.						1870.					
	Women.			Children.			Women.			Children.		
	Number.	Died.	Transferred.	Number.	Died.	Transferred.	Number.	Died.	Sent to Ceylon.	Number.	Died.	Sent to Ceylon
January	46	...	...	85	...	...	41	...	...	88	...	...
February	45	1	...	86	...	...	41	...	...	87	1	...
March	45	...	...	87	...	...	33	...	8	73	...	14
April	45	...	...	89	...	...	30	...	3	70	...	3
May	45	...	...	89	...	...	30	...	...	70	...	...
June	45	...	...	89	...	...	29	...	1	66	1	3
July	45	...	...	88	1	...	...	...	...	...	...	...
August	45	...	...	88	...	...	...	...	...	...	...	...
September	42	...	3	86	...	2	...	...	...	...	...	...
October...	41	...	1	82	2	2	...	...	...	...	...	...
November	41	...	...	88	...	...	...	...	...	...	...	...
December	41	...	...	88	...	...	...	...	...	...	...	...
Average ...	42½	1	3	86	3	4	34	...	12	756	2	20

DISTRIBUTION of Sick Married and Single of Ceylon Rifle Regiment at Labuan

Months.	Married Men in Barracks 1, 2, 3. Estimated Accommodation for 123 Men.				Single Men in Barracks 4 and 5. Estimated Accommodation for 82 Men.			Married have Letter M. attached.		
				Admissions.	Admissions.			Died.		
	Children.	Died.	Women.	Died.	Men.	All Diseases.	Fever only.	Other Diseases.	Fever only.	Total.
1869.										
January	85	...	46	...	46	15	13	116	40	35	....	...	..
February	86	..	45	1	46	5	3	116	37	28	...	...	...
March	87	...	45	..	46	5	3	116	31	23	...	M 1	1
April...	89	...	45	...	44	4	4	116	38	27	1	...	1
May	89	...	45	...	44	17	15	115	34	28	1	M 1	2
June	89	...	45	...	42	14	8	115	61	24	M 1	...	1
July	88	...	45	...	42	8	8	115	30	24	1 M 2	1	3
August	88	...	45	...	42	6	3	112	33	29	...	1	1
September ...	86	...	42	...	42	7	6	114	46	38	...	1	1
October	82	..	41	...	41	1	...	109	33	18	...	...	...
November ...	88	...	41	...	41	1	...	109	22	11	...	...	...
December ...	88	...	41	...	41	3	1	106	17	10	1	1	2
Average and Totals	86	3	42½	1	42½	86	64	115	412	325	6	6	12

SYNOPSIS of Space and Disease for Married and Single Men.

Empty Barrack Rooms 1, 2, 3 = 67,200 C. Feet, 4 & 5 = 50,400 ,,	Average Strength in 1, 2, 3, & 4 and 5 Barracks.	Average cubic space for each Person, allowing 3 C.F. for an Adult and 1 for a Child.	Average superficial area for each Person.	Sick for all Diseases.	Sick for Fever only.	Average Daily Sick.
Married Men occupying 1, 2, 3 Barracks ...	42½	388·7	27·9	86	64	11·5
Single Men in 4 & 5 Barracks	115	435·26	27·82	412	325	

RETURN of Sickness and Mortality in Her Majesty's Jail at Labuan, from September 1857 to December 1869.

Diseases.	1857.		1858.		1859.		1860.		1861.		1862.		1863.		Total in 6⅓ Years.		1864.		1865.		1866.		1867.		1868.		1869.		Total of 12 Years and ⅓.	
	65		55		105		95		96		104		103		98 3		100		95		80		84		70		130		95 8	
	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.	Admissions.	Died.
Fevers...	29	1	96	6	452	2	176	...	254	..	89	...	77	...	1,173	9	100	...	135	...	50	1	91	1	82	...	248	1	1,879	12
Diseases of Lungs	...	...	3	1	11	...	11	...	15	...	3	...	1	...	44	1	...	...	...	...	...	...	...	...	...	...	...	...	44	2
,, Stomach and Bowels	16	6	25	4	51	4	35	2	35	1	29	3	17	...	208	...	...	...	...	...	...	...	...	...	...	...	...	...	208	0
(*a*) Dysentery	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...	8
(*b*) Diarrhœa	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14	...	...	...	...	...	...	...	...	...	...	...	1	...	21
Rheumatism	5	1	15	...	16	...	12	...	21	...	6	...	8	...	83	1	...	...	...	...	...	...	...	...	...	...	...	...	83	1
Diseases of Skin	...	...	4	...	4	...	9	...	6	...	1	...	1	...	25	0	...	...	...	...	...	...	...	...	...	...	...	...	25	0
Abscesses and Ulcers	19	1	38	...	59	...	45	...	27	...	10	...	63	...	261	1	...	...	...	...	...	...	...	...	...	...	...	...	261	5
Accidents and Wounds	2	...	4	...	31	...	21	...	18	...	5	...	17	..	98	0	...	...	...	...	...	...	...	...	...	...	...	2	98	4
Dropsies	1	...	3	...	4	...	5	...	2	...	1	1	...	...	16	1	...	...	...	...	...	...	...	...	...	...	...	1	16	5
All other Diseases	50	1	106	...	16	2	27	1	29	...	23	...	7	1	258	5	127	1	110	0	60	0	104	...	99	...	122	...	880	7
Total...	122	10	294	11	644	8	341	3	407	1	167	4	191	1	2,166	38	227	1	245	8	110	3	195	7	180	3	370	5	3,494	65

1857, from Hong Hong, 50 convicts bad condition.
1858, ,, 50 ,, good condition.

In Nov. 1868, 50 convicts from Singapore, nine died 18 months after arrival.

CONTRAST between Military and Convicts for the Years 1868-69 at Labuan.

Months.	Military, 1868.					Military, 1869.					Convicts, Average Strength 132, 1869.			
	Strength.	Fever Admissions.	Fever Deaths.	Other Admissions.	Other Deaths.	Strength.	Fever Admissions.	Fever Deaths.	Other Admissions.	Other Deaths.	Fever Admissions.	Average Days in Hospital.	All other Admissions.	Average Days in Hospital.
January	156	7	...	9	...	165	48	...	7	...	23	3·6	3	4·
February	158	4	...	6	...	166	31	...	11	...	6	1·5	8	2·4
March	157	5	...	7	1	166	26	1	10	...	12	2·5	13	5·3
April	157	1	...	1	...	166	31	...	11	1	12	1·4	13	4·3
May	155	2	...	6	...	165	43	1	8	1	34	3·3	11	7·1
June	155	22	...	8	...	163	62	...	13	1	44	4·3	10	3·4
July	153	27	...	6	2	162	32	1	6	2	28	6·5	18	12·5
August	153	29	...	18	...	159	32	1	7	...	20	9·1	14	10·3
September	151	23	...	8	1	156	44	1	9	...	28	8·1	7	5·6
October	151	37	...	19	...	155	18	...	6	...	19	8·1	11	8·5
November	151	15	...	20	...	154	11	...	12	...	12	6·	8	5·6
December	156	11	...	11	...	154	11	1	9	1	10	3·4	6	5·1
Average and Total	155	183	...	119	4	160	389	6	109	6	248	4·8	122	6·1

APPENDIX No. VIII.

THE RELATIVE HEALTH OF THE RIGHT AND LEFT WINGS OF THE 58TH REGIMENT.

By Surgeon E. L. LUNDY, M.D., 58th Regiment.

IN January 1869 the Head-Quarters and Right Wing of the 58th Regiment, which had previously been quartered at Darjeeling, and had enjoyed excellent health, were amalgamated at Allahabad with the Left Wing, which had been stationed at Benares, and had never been healthy there.

A draft from England joined at the same time, and from this date to the 23rd August, nearly twice as many admissions and deaths, chiefly from cholera, dysentery and diarrhœa, dyspepsia and venereal diseases, occurred in the Right Wing and Draft as in the Left Wing.

A communication to the above effect having been received through the Quartermaster-General by the Director-General of the Army Medical Department, he caused the following questions to be submitted to the Principal Medical Officer.*

1. Were the men of the companies of the Right Wing, when first sent to Darjeeling, in any way selected; that is, were the more healthy men of the whole regiment transferred to them, and the more healthy men of the Right Wing transferred to the Left, which was remaining at Benares?

The men of the Right Wing when leaving Benares were in no way specially selected, there were no transfers from the Left Wing.

The composition of the Right Wing when it left Benares, was the same as when it arrived in the country.

2. What number of weakly and sickly men were invalided from the Left Wing at Benares, and how many died there? and did the Left Wing thereby become weeded of all the sickly and weakly men?

From the time of the Right Wing leaving Benares, 34 men were invalided, and 25 died in the Left Wing (list of diseases appended); there was also a detachment of two and a half companies at Azimghur, from which 8 men were invalided, 1 died.

As drafts arrived from England, they were sent up to Darjeeling and incorporated with the wing there, and a similar number from the wing at Darjeeling were sent to Benares. Thus far, it may be said that the Left Wing was from year to year weeded of its sickly men, and reinforced by healthy men, as great care was taken in the selection of those sent down to the plains from the hills.

3. What barracks at Allahabad have the wings

On the arrival of the regiment in Allahabad both wings occupied the Clydesdale Lines Barracks, the

* The reader is referred to a pamphlet re-published from the "Indian Medical Gazette," by Assistant Surgeon J. D. Ambrose, under the following title:— "Points of Interest in the Medical History of Her Majesty's 58th Regiment during the last five years, with special reference to the advisability of locating all, or nearly all our European Troops in India on the mountain ranges." This document having already appeared elsewhere it has not been deemed advisable to include it among those published in the present volume.

occupied respectively since arrival at that station ?

married people being in the Mansfield Lines, and remained in occupation until the 22nd March, on which day two men were admitted into hospital with cholera from No. 8 Barrack, Clydesdale Lines; these two men slept in beds opposite to each other. Next day four cases were admitted from the same barrack, and one from No. 11 Barrack which was opposite and to leeward of No. 8. On the 23rd, three companies were sent to Chatham Lines, which were distant about one mile from the Clydesdale Lines. No. 8 Barrack was shut up, and the remainder of the men were spread out in the two other barracks vacated by the companies above-mentioned.

This move not having the desired effect, the detachment sent to Chatham lines moved into camp, 1st at Papamow, 2nd to a camp across the river Ganges, which was distant from Allahabad about six miles. Here they apparently shook off the disease, and on the 17th April they returned to cantonments and occupied the new barracks.

In the mean time, on the 30th March, that portion of the regiment left in Clydesdale and Mansfield Barracks were moved by rail to a camp six miles from Allahabad in the Cawnpore direction, subsequently proceeding to fresh ground four miles further, where they apparently shook off the disease, and they were ordered to return to cantonments, and occupy the new barracks. This intention had to be altered, as only the evening before the day on which they were to have gone in, the detachment which had previously occupied quarters there, were re-attacked with cholera after being only 48 hours in occupation. The Head-Quarter detachment, in place therefore of occupying the new barracks were re-quartered in Chatham Lines, which in the meantime had been fumigated, &c. Cholera having re-appeared amongst them, they were immediately moved out to the New Barracks, and were there joined by the remainder of the regiment. Cholera having attacked the quarters occupied by the married people, 13 families were moved across the Ganges, to Jhoosie Rest-House; the disease still continuing, a re-distribution of the corps was made amongst the Mansfield, Clydesdale, and Chatham Lines, one company proceeding to Jhoosie. The married people, with the exception of the above-mentioned portion, remained in the New Barracks.

Two companies occupying the old barracks having been severely attacked on the 11th June, were at once moved into camp, six miles distant on the Cawnpore Road, where they were joined by the married people, who at the same time were for the same reason obliged to abandon the New Barracks. After a time they were allowed to return to cantonments, the married people occupying the New Barracks, the two companies above-mentioned joined the remainder of the regiment at the Chatham and Clydesdale Lines. The regiment was now free from cholera until 22nd July, when two fatal cases cases occurred in Chatham Line Barracks. Two companies were at once moved into

camp, and a few days after the remaining occupants were also moved into camp. The Head-Quarters and three companies, occupying Clydesdale Lines faring no better, also proceeded under canvas, going by rail down the Jubbulpore Line, 50 miles from Allahabad; they were followed by the remainder of the regiment which was broken into two detachments, one at a distance of 45 miles, the other 40 miles from Allahabad. Here they remained until the 23rd September, when the regiment returned into the New Cantonment Barracks.

With regard to the moves, those companies that were attacked were first selected, so that the original companies of the Right and Left Wing were indiscriminately mixed, but the barracks occupied by all were of the same class and description.

4. What were the comparative ages of the men who are included in the three sections embraced in the Return rendered by Dr. Lundy in conjunction with the Adjutant and Commanding Officer of his regiment?

COMPARATIVE AGES.

	Under 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 and upwards.	Total.
Right Wing ..	32	98	120	106	29	5	390
Left Wing	5	119	84	32	3	..	243
Draft	18	64	12	2	..	..	96

5. What had been the antecedent relative mortality in the Right and Left Wings during the three and a half years the regiment has been in India?

Right Wing, 36 deaths; Left Wing, 51 deaths.

6. Did the personnel of the Right Wing remain unchanged during the whole period of its residence at Darjeeling? that is, did each individual included in the strength of the Head-Quarters and Right Wing, pass the whole of their time in the hills from the first march from Benares until the date of leaving Darjeeling, and as a corollary, did each man, included in the strength of the Left Wing, pass the whole of his at Benares?

As drafts arrived from England they were at once sent up to Darjeeling, where from want of accommodation a similar number had to be sent to Benares.

A draft left Benares at the commencement of each year, chiefly made up of the convalescents of the Left Wing, which remained behind at Benares. Instead of, as is the usual practice, sending these invalids from the Left Wing to one of the convalescent depôts in the hills, they were sent up to join the wing at Senchal, and were not removed to Benares at the end of the year, but were retained permanently at Senchal, and incorporated with the wing there, room being provided for them by the dispatch of a similar number of men of the Right Wing to Benares. Thus the Left Wing at Benares was from year to year "weeded" of its weak and sickly men, and reinforced by healthy men from the hills. Another accession of strength to the Right Wing was in the shape of the annual draft from the depôt in England, numbering about 30 every year, which on arrival in the country was very properly sent up to the hills.

The following is a comparison of the vital statistics of the two wings during the three years of separation.

	Three Years.			Proportion per 1,000 per Annum.	
	Strength.	Deaths.	Invalids.	Deaths.	Invalids.
Right Wing (Darjeeling) ..	435	5	29	3·8	22·2
Left „ (Benares) ..	318	26	42	27·2	44·0

SUMMARY.

In 1868 the regiment was ordered to re-unite at Allahabad, and to occupy the new cantonments. Accordingly, towards the end of December the Right Wing from Senchal arrived at Allahabad, 390 strong, and in as splendid physical condition as it was possible for men to be. On the 12th of January, 1869, the Left Wing from Benares came in, 243 strong, looking very well, considering that the great majority of the men had spent four consecutive years on the plains. On the same day, a draft of 96 joined from England, nearly all of them very young men, of from 20 to 22 years of age. Such was the composition of the corps at the beginning of the year 1869.

As the new cantonments were not completed, the Clydesdale and Mansfield Barracks had to be occupied; seven companies in the former, one company and the married people in the latter. Two companies at the Fort, two miles distant, completed the disposition of the regiment. Thus far it will be seen that the two Wings occupied the same barracks, and I have failed to discover any satisfactory explanation as to the cause of the inmates of any particular barrack being singled out for attack, as was the case at the outset of the epidemic; or of the men of one wing suffering more than the other. On the epidemic appearing three companies were at first moved, two being of the Right, one of the Left Wing, and from this time forward, as other moves took place, companies of either wing were moved indiscriminately without reference to any particular wing; and after the epidemic had ceased, and the regiment became finally re-united in the new barracks, companies and wings had to be reformed, so that the original wings became extinct owing to this fresh formation. It may be said, however, that the men of both wings occupied barracks of the same class and description.

With regard to the men of the Left Wing they, in connection with the remainder of the regiment, suffered severely from fever on their arrival at Benares, and, as stated before, after the departure of the wing for Darjeeling, they gradually became weeded of nearly all sickly and weakly men, and on their joining the Head-Quarters at Allahabad they were in as good physical condition as men could be expected to be who had passed four years in the plains, two of them unusually severe.

On arrival at Allahabad, on January 12th, they were quartered in the same barracks as the Head-Quarter Wing, and remained there until the 23rd March, when the first move by either Wing was made. On that day two companies of the Right Wing and one of the Left were moved to Chatham Lines, and from thence on 27th March, to camp at Papamow, where on the 30th March they were joined by one more company from the Left Wing.

On the 3rd April the camp at Papamow was evacuated, and the four companies crossed the River Ganges and encamped at Ghuddapore, distant six miles from Allahabad. In the meantime the Head-Quarters and four companies, two of the Right and two of the Left Wing, vacated Clydesdale Lines on the 30th March, and encamped on the Cawnpore Road.

On 2nd April, Head-Quarter Wing, as above detailed, vacated camp on Cawnpore Road for another four miles distant in the same direction.

On 15th April, Left Wing re-crossed Ganges and occupied new ground at a place called Muddapore, where they remained until the 17th, when they were ordered into the new cantonment barracks. Cholera having again attacked them, they on the 20th April left the above barracks and proceeded to a camp

at Jhoosie, the other side of the Ganges, part of the men occupied the rest-houses and part were in tents.

On the 20th April, Head-Quarters Wing left the camp on the Cawnpore Road, and were ordered to take up their quarters in the new barracks, this arrangement had to be altered on account of the cholera appearing in the companies in occupation, and instead they were quartered in the Chatham Line Barracks.

On the 28th April the *Left Wing* evacuated their camp, and on the 1st May again occupied the new barracks.

On the 7th May the *Head-Quarter* Wing was ordered to the new cantonment barracks.

On the 30th May the regiment was distributed as follows :—

Head-Quarters, A and D Companies, occupying Clydesdale Lines; H Company, Mansfield; and C and F Companies, Chatham Lines; B Company, proceeding to rest-house at Jhoosie.

On 11th June H Company vacated Mansfield, and F Company Chatham Lines, and proceeded to occupy a camp on the Cawnpore Road, from whence they returned on 21st June to Chatham Lines.

On 1st July, B Company returned from Jhoosie and joined *Head-Quarters* at Clydesdale Lines.

On 24th July, C and H Companies vacated *Chatham Lines, proceeding to* a camp at Muddapore.

On 29th July, F and K Companies vacated Chatham Lines, proceeding to camp at Papamow.

On 7th August, Head-Quarter Companies vacated Clydesdale Lines, and proceeded to Camp Douchadeek, distant about 50 miles from Allahabad on the Jubbulpore line of railway.

On 17th August C and H Companies proceeded to Camp Debhourah, about 45 miles from Allahabad, on the Jubbulpore Line.

On 19th August, F and K Companies proceeded to Camp Burgurh, above 40 miles from Allahabad, on the Jubbulpore Line.

The above encamping grounds were well situated on nice rising ground, with a fair supply of water, and tolerably free from jungle.

On 23rd September and two following days, the detachments from the various camps proceeded by rail to Allahabad and occupied the new cantonment barracks, where they remained until their final move from Allahabad. Here an entire reformation of companies took place, so that it was almost impossible from this date to separate the men of the original Right and Left Wings. I think I may, however, say that the Left Wing which was stationed in Benares for three years maintained a fair standard of health, and that the Right Wing from Senchal went through the ordeal of 1869 very nearly, if not quite as well, in comparison with the other Wing; it is, therefore, only reasonable in accounting for the extra sickness and mortality to assign the cause to the prolonged exposure the men were submitted to during an unusually trying season.

In the reply to No. 6 question, it will be perceived that the whole of the original party that started from Benares did not spend three entire years at Darjeeling, as the drafts, which generally arrived early in November, joined by men recommended for change of air by the Invaliding Board, were sent up to Darjeeling, from whence similar numbers had to be sent to Benares, there being insufficient accommodation for the whole number. The probable number thus interchanged may be estimated at 200, of which number 99 were drafts from England, the remainder being made up of convalescent men, recommended for change of air, and married families, many of whom were sent to the hills for change for their children's sake.

LIST of Diseases for which Men of the Left Wing were Invalided, &c.

Disease.	Invalided.	Died.
Continued Fever	..	1
Ague	..	1
Cholera	..	4
Chronic Rheumatism	2	..
Secondary Syphilis	3	..
Phthisis	3	1
Anæmia	6	2
Hydrophobia	..	1
Paralysis	2	..
Neuralgia	1	..
Ophthalmia	1	..
Inflammation of Ears	1	..
Valve Disease of Heart	1	1
Dysentery	1	2
Diarrhœa	2	2
Fistula in Ano	1	..
Splenitis	1	..
Hepatitis	6	5
Bright's Disease	1	1
Necrosis	1	..
Boils	1	..
Accidentally Drowned	..	3
Amputation	..	1
Total	34	25

APPENDIX No. IX.

Inspection made by Dr. Massy on 3rd and 4th March.

REPORT UPON THE OUTBREAK OF TYPHOID FEVER AT PEMBROKE DOCK HUT BARRACKS, WHICH COMMENCED ON THE 15TH JANUARY, 1870.

By Deputy Inspector-General MASSY, M.D., C.B., Head of Sanitary Branch.

[The Plan attached shows the position of the different portions of the Camp.]

Barracks allotted to hold 31 Officers, 576 men, and quarters for 39 married soldiers.

THE hut barracks at Pembroke Dock are situated on the side of a hill facing a little south of west. The gradient upon which the huts stand is considerable, but is steeper just below, between the huts and the road at the foot of the hill which borders the "Pill" or Cove (a portion of Milford Haven), along the edge of which the road runs about 50 yards below. The soil is the old red sandstone.

The fall of the hill is chiefly from east to west, but it also tends considerably to the south.

Above the camp the hill is less steep, but is a gradual ascent for several hundred yards of open grass-land, which is in War Office occupation.

Description of Camp.

The mens' huts are in two blocks, forming a parallelogram. The short sides of the parallelogram run up and down the hill, and each individual hut is similarly arranged. The two blocks of huts are divided by a road into the North and South Camp.

The Officers' huts are well placed upon a high promontory at the north-western portion of the camp, having the sea (Milford Haven) in front and on two sides of it.

The hospital is at the southern end of the camp, in a sunken position—the lowest in it.

The huts, with the exception of a few iron ones, are the ordinary wooden huts; they are 26 feet apart from end to end, and 20 feet from side to side; they are 38 feet long by 20 feet wide, and 8 feet to eaves; the allotment to each is 18 men. They are heated by stoves, and ventilated in the ordinary way by windows and at the ridge. They are raised a few inches from the ground on dwarf brick walls, but heretofore there has not been any ventilation under the floors; this, however, was being provided during my investigation.

The camp was formed in 1856, and annually one or two of the oldest huts were replaced by brick ones of nearly similar dimensions, raised from the ground, having free ventilation beneath the floors. These new huts are supplied with Sherringham valves and ventilating grates; they are shaded on the plan.

Latrines.

There are two large latrines for the use of the men, women, and children; one for each division of the camp, and marked on the Plan as 18 and 69 huts. They are large open receptacles, and I was informed by Colonel Mann are lined with brick set in cement. The sewer from the one in the North Camp passes from the latrine to the edge of the cliff at a gradient of 1 foot in 8, it then descends almost perpendicularly to the beach, and the remainder of its course for 250 yards below low-water mark is nearly horizontal. The first portion is constructed of brick lined with cement and 18 inches in diameter. the remainder of iron and earthenware pipes, 12 inches in diameter. There is a tank close to the latrine capable of holding 400 gallons, for the purpose of flushing, supplied with sea-water by a force-pump.

The sewer of the latrine in the South Camp passes to the south of the hospital, and discharges into the "Pill" west of the position, a long distance from the shore. There are no other sewers in the camp.

Drainage. There are several surface drains, the contents of which run into the sea, but the surface drainage is very incomplete, and much is needed to improve it. In some parts it is pretty good, brick surface drains existing, but in others again there are none, the rain-water wearing channels for itself, and lodgment here and there occurs, though usually, from the great fall, the surface is kept dry; but drains are much needed to prevent soakage under the huts.

The ash-pits are at each flank; they are very large open brick receptacles; they are altogether too large, and present an extensive foul surface.

Water supply. The water supply is exclusively from three wells, marked on the Plan as Nos. 1, 2, and 3. No. 1 is below the level of the latrine, which is 135 feet from it; No. 2 is above the huts, close to the Gymnasium, and though over 200 feet from No. 3, which is at a much lower level, is drained by it. No. 3 well is within 75 feet of the latrine, and I believe the water level is below the latrine, but the well is higher up the hill than the latrine, and there is no suspicion of soakage into the well. A large ash-pit is 77 feet higher up the hill.

Town of Pembroke Dock. The town of Pembroke Dock extends from the foot of the hill on which the barracks stand across the low land to the high ground on the opposite side of the valley,—nearly a mile in extent. I do not exactly know the number of the population. More than two-thirds of the town stands on limestone, the remaining portion on red sandstone. It possesses neither sewerage nor water supply, properly speaking. All the latrines are cess-pits, and water is obtained from the roofs of the houses and stored in tanks. It is not easy to imagine worse sanitary conditions.

Previous health of troops. On looking through the returns of sickness and mortality amongst the troops at this station for the last four years, I find that the average daily sick has been less than 3 per cent., and that there has not been a case of enteric fever during that period, though continued fever and diarrhœa have annually appeared, but not to any marked extent. Attached are Returns of sickness and mortality for 4 years, beginning from 1866. Returns of the sickness amongst the women and children are also attached, for the purpose of showing what have been their respective states of health from 1866 to March 1870. There is nothing remarkable in them except that during the year 1870, 53 cases of measles had occured among the children, only one of which terminated fatally.

Women and children.

Cases of enteric fever. From the 15th January to the 11th March, 21 cases of enteric fever (*see* p. 358) occurred; of these 4 died. A boy aged 14 was the first attacked—on the 15th of January; he lived in hut 29, one of the new brick huts erected only 2 years ago. The next case was that of a child at hut 54, a totally different part of the camp. On most careful inquiry from the three first cases no extraneous origin could be discovered; they had all been several months at the station. The cases then occur scattered, following no order of succession, either as regards occurrence in the same hut, or in huts in proximity. In 7 instances only 1 case occurred in each hut; in 5 instances 2 cases occurred in each hut, and in 1 instance 3 cases. The 11th case occurred at Screveston Fort, a new fort, about 2 miles from Pembroke Dock, occupied by a small detachment as a working party. No other case happened there among the military, though cases occurred in the vicinity. The man was admitted on the 2nd February; he had been ill for some days prior to admission; he had occasion to come to the camp on the 3rd January to settle his accounts, visited his comrades in No. 23 hut, and drank water. The last case was admitted on the 11th March; the man had been sent on detachment from Pembroke Dock to Penally on the 2nd, was attacked by fever on the 9th, and brought into hospital at Pembroke Dock on the 11th; before leaving Pembroke Dock he had lived in No. 30 hut. It will be seen that all the cases occurring in camp, except two children in 49 and 54 huts, lived in the North Camp.

The disease at first was believed to be common continued fever, but it was speedily recognized, from which time the excreta of all patients were deodorized and buried. The cases I saw in hospital were undoubtedly enteric fever; several of them had the characteristic eruption, and the *post-mortem* appearances of three of the fatal cases shown to me were plainly indicative of the disease.

Views held by Medical Profession.

We may here glance at the views held generally by the Medical Profession as to the agencies said to be productive of enteric fever. Some hold that sewage contamination of water or air, under certain circumstances, gives rise to it; others, that fœcal contamination of water or air is necessary; while it is said again by others that, in either or any event, it is essential a first case should be imported, or the essential element of enteric fever find access to water-closet, sewer, or water by the excreta of a diseased person. It is said not to be essential that the excreta be recent; the element may have lain dormant for a time, and be brought into activity by favourable conditions. Without holding myself to any particular view, I will briefly consider the conditions of Pembroke Dock as regards these different assigned causes in connection with this outbreak of fever.

Circumstances connected with outbreak of fever.

Though not prominently a disease of children, it attacks young people rather than middle-aged or old. None of those attacked at the camp exceeded 21 years of age.

The stage of incubation is stated to be from 7 to 15 days, but sufferers from this disease are often unconscious of its existence for many days, going about their ordinary avocations.

On looking at the Plan of the camp it at once strikes one that the fever cases, with but two exceptions (children in 49 and 54 huts in the South Camp), occurred in the north division of the camp, and as both divisions are similar in huts and soil and nearly so in occupation, except that there are more married men and families in the south, one is led to look for the cause in the North Camp. It has been said before that there are no sewers in either division except from the latrines, neither of which has a course through the camp.

The report of the analysis of the water attached shows that the three wells the sole source of supply for cooking and drinking, contained good water. Unfortunately, however, the specimen of suspected water from No. 1 well was broken in transit, and the consequence was that an interval of six days took place before the second specimen was received at Netley. At one time, from the fact that every person attacked had drank the water from No. 1 well, it was believed to be the cause of the fever. All the inhabitants of the North Camp drank of it, but with the exception of 5 huts, Nos. 45, 46, 49, 54, and 56, the occupants of the south division drank the water of No. 2 or No. 3 well, and out of those 5 huts a child in 2 of them had suffered. The contamination was suspected either from percolation from the latrine above the well, through the porous soil, or from a surface drain which ran down from the side of the latrine, receiving surface impurities from the vicinity of the different huts it passed, and which fell into a catch-pit leading into a box drain that coursed within 3 feet of the upper side of the well. At the centre of the drain a leaden pipe passed through to the well, for the supply of a wash-house with water. The pipe ran from the drain to the edge of the well and then bent down at a right angle to reach the water. The contents of the drain could trickle down the sides of the pipe to the well, and the man-hole of the well was flush with the ground. The water from this well having been pronounced good invalidates the theory of water impregnation in this case, yet I must observe that the position of the surface drain was very suspicious of contamination, and I noticed myself a slight trickling of surface-water over the edge of the man-hole. At one part of its course several urine tubs were resting on the drain, and I would further add that the specific poison of enteric fever has never been recognized or isolated by chemical test, and, *if* such exists, might it not have been in this water in a minute quantity of organic matter from this source, or by percolation from the latrine. Many able chemists hold that water may be chemically considered pure and still possess the power of exciting diseased action in those who drink it. The results of the analysis subsequent to the outbreak can scarcely be received as affording an accurate index of what was the state of the water at an earlier date.

No. 1 well being suspected, an order was issued on the 23rd February prohibiting its use for drinking or cooking purposes. We will assume that the order was obeyed from the 24th inclusive. Only 3 individuals were admitted into hospital for enteric fever after that date, one on the 26th, another on the 10th March, and the third on the 11th. If the water of this well were the cause of the fever in previous cases, all three would come within the period of

incubation. The case admitted on the 10th had been under observation for several days prior to his admission. The man admitted on the 11th had been sent on detachment from Pembroke Dock to Penally on the 2nd March; on the 9th he complained of being ill, and on the 11th was brought back and admitted to hospital for enteric fever. He was the only man of the detachment at Penally who was sick, and whatever was the origin of his illness I have no doubt it was contracted at Pembroke Dock Camp.

The latrine at 18 hut in the North Camp has been already described briefly; 19 is an ablution room; 17 a cook-house. The other rows of huts in this division are occupied by soldiers, and a few by families.

During the prevalence of fever the thermometer ranged low, and the wind was almost invariably north, or north and by east, occasionally a point west; thus carrying the air from the latrine over the camp. Up to the appearance of the first few cases of fever the latrines were only flushed twice a week, afterwards more frequently, and latterly once a day. It is impossible that large exposed surfaces, such as these latrines, will not smell offensively, though at the time of my inspection they were as clean as such places can be expected to be. Everyone living in the North Camp used this latrine, and the children who went to school from the South Camp also used it, as the school is in the northern division; but the child attacked in 54 hut did not go to school, and therefore her mother said she used the latrine in the South Camp. Here is a link broken in this chain; this child, however, drank the water from well No. 1. How far would the influence of infection connect it? A child who does not go to school would have little chance of being infected by other children, and no other child in the hut was affected; and infection from person to person is generally recognized as a feeble means of extension of this disease; moreover, the men of the South Camp, who were in constant communication with those of the North, did not suffer.

The huts are, as previously stated, very close together, 18 men ordinarily occupying each hut; they are fairly ventilated, and there is no ground in this respect for believing the disease to have resulted from defective ventilation. As already observed, there was no ventilation under the floors. On lifting up a portion of the floor, in several of them a thin layer of mould existed, but the earth was not damp, and the joists were quite sound, so much so that where new brick huts are erected the old joists have been used in their construction. I am not aware that such a state of things has ever been assigned as a cause of enteric fever.

Moreover, all the huts in the South Camp where fever did not exist are of the same construction; and again, two cases occurred in each of the huts 28 and 29, which are new brick huts only erected a couple of years, having free ventilation under the floors, and one came from No. 30, a new brick hut built last year.

Cases of enteric fever had occurred in the town, and also it was said in the district, but the evidence of the extent was very unsatisfactory. One practitioner denied that the disease existed, or could have existed without his knowledge. Another stated about ten cases to have occured in the town, but that none were fatal. The Registrar gave 10 fatal cases from March 1869 to March 1870 in his district.

How far could an epidemic influence be credited to have occasioned the outbreak in the camp? Assuming in this instance epidemic to mean some condition of atmosphere which produced and fostered it, or fostered it when produced, we must, I think, assume that such influence would have been general, if not in the neighbourhood, certainly in the camp; but here we have the distinct fact of the disease almost confined to the northern and smaller portion of the camp, while the southern, with the exception of two children in contiguous huts, escaped.

But the epidemic theory has another phase which I cannot omit to mention, not only on its own grounds of possibility, but from the fact of the evidence failing to establish beyond question the other theories. An epidemic condition of atmosphere existing, were not the local circumstances of this large latrine, not flushed daily until late in the epidemic, the wind blowing from it over the camp, sufficient to fix it endemically to the portion of the camp in its vicinity?

The 3rd Depôt Battalion was broken up and the various depôts composing it removed on the 15th March. The camp is not to be re-occupied until the end of the month. In the meantime the huts will be fumigated and the windows left open day and night.

The following measures have been since adopted :—

1. The surface drain has been diverted from the vicinity of No. 1 well, add the man-hole raised above level of ground.

2. Ventilation has been introduced under the floors of the huts.

3. Carbolic acid has been freely used in the latrines after flushing.

Recommendations.

I beg to make the following recommendations :—

1. The drainage of the camp to be carefully examined, repaired, and completed.

2. The ash-pits to be much reduced in size.

3. The latrines are too close to the inhabited huts; the one in the North Camp is only 26 feet from a hut inhabited by 18 men, and 20 feet from the cook-house. This I think very objectionable; moreover, in summer the flies pass directly from the latrine to the cookhouse, and *vice versâ*.

I am anxious to avoid unnecessary expenditure, but it would be very advantageous could these latrines be moved a *little farther off*, the one to the north, the other to the south, and at the same time their construction might be improved. Unless, however, the well No. 3 in the South Camp were abandoned it would, I believe, be impracticable to remove the latrine in that portion of the camp. Whether they were removed or not, I would recommend their being always regularly flushed daily.

4. The water not having been found to contain impurities is, I admit, a forcible argument against any change in the source of supply, but I strongly object to the principle of drawing the water supply from wells situated below latrines in their vicinity in a very porous soil. I would submit the question to any experienced sanitarian, confident that he would support my view. I may observe that Professor Parkes is quite of my opinion. So porous is the soil that, as previously stated, No. 2 well is drained by No. 3—over 200 feet from it. If it could be managed that by deep sinking or otherwise, the water of No. 2 well could be confined to its own source, cut off from No. 3, it would probably suffice and remove this objection, as No. 2 well is above all source of pollution, close to the Gymnasium, the roof-water from which it is intended, after filtration, to carry into it.

Should this not be practicable, or should the supply from No. 2 be found insufficient, I am forced to recommend that a well should be sunk higher up the hill, in the open ground above the camp.

There were 65 women and 101 children in camp on the day of my inspection. There were 4 families generally in each hut; in some, in addition to the 8 adults, there were as many as 10 children, which, with all their belongings, occasioned I cannot but think, great over-crowding; and if such existed in previous years, it is strange disease did not result. If infectious disease was seeking a nidus it could hardly find a more favourable state of things to foster and spread it: 53 cases of measles occurred from the beginning of the year to early in March; these families live almost together, a small curtain or sheet at most separating them. It is not my province to dwell upon the indeceney of such association, but on sanitary grounds it is bad. Delicacy of constitution, but I fear no other delicacy is likely to result from it. I was told that it is intended to build married quarters on the ground above the camp. Should such be the case, I would suggest, as a better arrangement, to appropriate the present hospital for the families; it would be ample for the purpose, and there is ground attached to it which would be very useful to them.

A hospital could then be built on the high ground above the camp, the site of the present hospital being very objectionable.

I would beg attention to the foregoing, as the occurrence of 21 cases of enteric fever and 4 deaths in a small barrack in England at the present day is a serious matter. I am glad to say, however, that this instance is unique; but if it is, as it is believed to be, a preventible disease, its recurrence would be almost culpable.

The Army Sanitary Committee having had under consideration the above Report, and the camp having been visited and inspected by several of its members, submitted the practical results at which they had arrived to the Secretary of State for War. The Committee traces the outbreak of fever to the large latrine at the north-east angle of the camp, mainly through pollution of the atmosphere, which at the time was carried by the prevailing air currents over and through the affected huts, and in all probability partly from impure surface-drainage leaking into the water-tank supplying most of the huts through defects in the drainage, since removed. The objections to the latrine urged by the Committee are—that it is much too close to the camp huts; that it is much too large for the requirements of the troops, and that the construction is unsuitable. They advise:—

"1. The construction of an earthernware water latrine on Mr. Jennings' "principle, containing no more than the number of seats required for this "division of the camp, on a site which they examined beyond the line of the "huts and to the north of the present latrine.

"This site is close to the line of the main sewer draining the present latrine, "and also to the pipe by which salt water is pumped up for flushing.

"At the time when this improvement is being made it would be advisable "to ventilate the sewer at the point of most rapid descent, and to place in the "ventilating opening a box containing charcoal, through which all reflex sewer "gases may pass during the time of flushing or rise of tide, which gases under "present arrangements are discharged through the existing latrine into the "atmosphere of the camp.

"2. When the new latrine is completed the present latrine should be "removed altogether, and the trough should be flushed out and filled with "rammed earth.

"3. The Committee have limited their recommendations only to the most "urgent improvement, but in the course of their inspection they found much "requiring alteration if funds were available. For instance, some parts of the "camp are constructed on steep inclines, and liable to the influence of damp "subsoil. There is another latrine at the south-west angle of the camp, which "should be improved in the manner recommended above.

"The hospital is at the lowest level and in a very close confined locality.

"The tank supplying this end of the camp is close to an undrained street "of houses.

"The surface drainage of the camp admits of considerable improvement.

"The site of part of the camp is not altogether such as might be desired "for health. It would have been better to have placed part of it higher up "the hill, and it is worth considering whether, in removing existing huts, some "change of position might not be advantageously made.

"The water supply is obtained from tanks into which drains the subsoil "water from a bed of old red sandstone *debris* on which the camp has been "placed.

"Water from all the wells has been examined by Mr. Abel, since the Com- "mittee's visit, with the object of ascertaining the present condition of the "water as an element in the general sanitary state of the camp. They all yield "nitric acid and organic matter, not in any great quantity, but still sufficient "to indicate the existence of oxydized organic compounds in the subsoil. "The amount is not sufficient to constitute the water an unhealthy water, "but quite sufficient to stand in the way of selecting sources of this if better "water could be obtained. The Committee were informed that good water was available from clean ground considerably above the present site, from "whence it could be laid on to the camp.

"It is necessary to allude to these points as all bearing more or less on the healthiness of the camp; but the immediate improvement required is in the latrine accommodation."

NOMINAL LIST OF PERSONS attacked with Enteric Fever at Pembroke Dock Hut Barracks between 15th January and 11th March, 1870, with other particulars referred to in the Report.

No. of Case.	Corps.	Rank and Name.	Age.	Date of Admission into Hospital for Enteric Fever.	Time at Station.	No. of Hut.	Remarks.
1	37th ..	Boy, T. Cornell	15	15th January	6 months..	29	Disease changed from "simple continued fever."
2	..	Child, J. Mannion ..	12	Not in hospital / Attacked 17th January	..	54	Recovered.
3	9th, 1st Bn.	Private J. Thompson ..	20	19th January	4 months..	25	
4	9th, 1st Bn.	Private J. Morgan ..	18	22nd January	5 months..	36	Died 4th February.
5	37th ..	Boy, J. Owens	14	28th January	6 months..	29	
6	62nd ..	Private J. Borwick ..	18	28th January	5 months..	28	Died 5th February
7	9th, 1st Bn.	Private E. Slater	18	30th January	5 months..	23	
8	9th, 1st Bn.	Private M. Nolan ..	18	30th January	4 months..	36	
9	36th ..	Private J. Murphy ..	18	31st January	5 months..	35	
10	9th, 1st Bn.	Private W. Matthews ..	19	1st February	5 months..	23	
11	9th, 1st Bn.	Private W. Stone.. ..	20	2nd February.. ..	5 months	Screveston Fort.	
12	..	Child, M. Donoughe ..	14	Not in hospital / Attacked 6th February	..	49	Recovered.
13	58th ..	Private J. Thompson ..	21	8th February.. ..	12 months..	38	Died 17th February.
14	..	Child, L. Hunt	4	Not in hospital / Attacked 10th February	..	14	Recovered.
15	9th, 1st Bn.	Private E. Buckingham ..	20	13th February	4 months..	23	Died 15th March.
16	..	Child, F. Trevor	5	Not in hospital / Attacked 15th February	..	15	Recovered.
17	9th, 1st Bn.	Private J. Dellow ..	21	19th February.. ..	4 months..	25	
18	62nd	Boy, G. Featherstone ..	14	22nd February.. ..	4 months..	28	
19	58th	Boy, W. Kindlaw.. ..	16	26th February	3½ years ..	39	
20	..	Soldier (name not stated)	..	10th March	..	39	The patient had been under observation for some days.
21	..	Soldier (name not stated)	..	11th March	..	30	Admitted from Penally.

N.B. With the exception of the four patients noted in the "Remarks" as having died, all the cases recovered.

3rd Depôt Battalion Hospital.

Return of Admissions &c., (1) from all Diseases, and (2) from Continued Fever, Dysentery, and Diarrhœa, for the Four Years 1866–1869.

Year.	Average Strength.	Admissions from all Diseases.	Admissions from				Ratio per 1,000 Admitted.		Average Daily Sick per 1,000 of Strength.	Remarks.
			Continued Fevers.	Dysentery	Diarrhœa.	Total.	All Diseases.	Continued Fever, &c.		
1866	885	398	17	..	6	23	449·7	26·0	14·8	This includes men quartered at the defensible barracks and forts in the vicinity.
1867	1,034	601	2	5 2 deaths	10	17	581·2	16·4	23·2	
1868	1,136	679	6	7	38	51	597·7	44·9	23·9	
1869	875	658	6	3	9	18	752·0	20·6	32·3	

Number of Women and Children who have been Attacked with the undermentioned Diseases.

Diseases.	Women.					Children.					Remarks.
Strength	139	124	109	116	129	176	187	188	211	183	
	1866.	1867.	1868.	1869.	1870.	1866.	1867.	1868.	1869.	1870.	
Cholera	1	..	..	..	..	..	..	..	..	..	
Ague	..	1	2	3	..	..	6	..	..	..	
Remittent fever	..	1	..	..	..	..	1	..	..	..	
Continued fever	..	1	..	..	1	..	..	1	6	..	
Scarlet fever	..	..	..	..	..	..	..	4	..	1	
Diphtheria	..	..	..	..	..	..	..	3	..	..	
Measles	..	..	..	..	..	..	..	..	6	53	
Enteric fever	..	..	..	..	..	..	..	..	..	4	
Total	1	3	2	3	1	..	7	8	12	58	

3rd Depôt Battalion Hospital.

Number and Diseases of Men who have Died since the arrival of the Battalion at this Station on the 29th April, 1866.

Diseases.	Year.					Total.	Remarks.
	1866.	1867.	1868.	1869.	1870.		
Intemperance	1	..	..	..	..	1	This includes men quartered at the defensible barracks and forts in the vicinity.
Phthisis Pulmonalis ..	4	3	6	1	..	14	
Chronic Dysentery ..	1	..	..	..	..	1	
Hæmoptysis	1	1	..	1	..	3	
Acute Dysentery ..	..	2	..	..	..	2	
Ague	..	2	..	..	..	2	
Pericarditis	..	1	..	..	..	1	
Enteritis	..	1	..	..	..	1	
Ascites	..	1	..	..	..	1	
Concussion of Brain ..	..	1	..	..	..	1	
Tertiary Syphilis ..	..	..	1	..	..	1	
Pneumonia	..	..	2	..	..	2	
Icterus	..	..	1	..	..	1	
Bright's Disease	..	..	1	1	..	2	
Scarlet Fever	..	..	..	1	..	1	
Simple Continued Fever.	..	..	..	1	..	1	
Hepatitis	..	..	..	1	..	1	
Enteric Fever	..	..	..	..	3	3	
Degeneration of Heart ..	..	..	1	..	..	1	Died out of hospital.
Narrowing of Aorta ..	..	..	..	1	..	1	
Gun-shot Wound ..	..	..	..	1	..	1	
Drowned	..	..	..	1	..	1	
Total	7	12	12	9	3	43	

3rd Depôt Battalion Hospital.

List of Deaths of Women and Children since the arrival of the Battalion at this Station on 29th April, 1866.

Women.

Average Strength	139	124	109	116	129
Diseases.	1866.	1867.	1868.	1869.	1870.
Cholera	1	..	..	..	..
Continued Fever	..	1	..	..	..
Anæmia	..	1	..	..	..
Phthisis Pulmonalis	..	1	..	..	..
Abscess	..	..	1	..	..
Total	1	3	1	..	..

CHILDREN.

	Year.				
Average Strength	176	187	188	211	183
Diseases.	1866.	1867.	1868.	1869.	1870.
Phthisis	1	..	1	..	..
Meningitis	1	..	..	..	..
Convulsions	1	2	..	..	2
Bronchitis	1	1	..	..	..
Pneumonia	1	1	..	..	..
Dentition	1	..	..	..	..
Asthenia	2	..	..	1	..
Tabes Mesenterica	..	1	1	1	..
Encephalitis	..	..	..	1	..
Hydrocephalus	..	..	..	..	1
Total	8	5	2	3	3

REPORT ON THREE SAMPLES OF WATER RECEIVED FROM PEMBROKE DOCK IN MARCH 1870.

By E. A. PARKES, M.D., F.R.S., Professor of Hygiene.

THREE glass bottles were received on the 3rd March, 1870, from Pembroke. One of these was broken in transit; it had contained water from a well close to the serjeant's mess. Immediate application was made for some more water from the well, and a fresh supply was received at Netley on the 9th March. These dates are given because this water was suspected of being concerned in the production of the fever at Pembroke. The analysis shows that the water received on the 9th March could not have had any bad effect; but of course it is impossible to say what may have been the condition of the water at an earlier period, when the cases of fever appeared.

The two bottles which were unbroken contained water from a well close to the gymnasium, and from a well in the vicinity of the hospital.

These waters are thus termed in this Report:—

No. 1. Serjeants' Mess Well.
„ 2. Gymnasium Well.
„ 3. Hospital Well.

No. 1. *Serjeants' Mess Well.*

On the 9th March, this water was found to be perfectly transparent, bright, colourless, tasteless, and without smell. There was a small, almost imperceptible sediment.

It was tested carefully for the oxydizable products of sewage. There was no nitrous acid, a slight amount of nitric acid, and a small quantity of

ammonia*. It was therefore certain that there was no evidence of recently oxidized sewage products.

It was then examined for oxidizable matters by a standard solution of potassic permanganate. All oxidizable matters in a litre of water only required ·00016 grammes of oxygen, or ·0112 grains of oxygen per gallon of water. The amount of potassic permanganate destroyed per litre was only ·000632 grammes. The amount of chlorine was 3·943 grains per gallon.

It therefore appears certain that there was very little oxidisable organic matter in the water; there was very little evidence of organic matter which had been oxidized, and that the amount of chlorine was moderate.

It seems therefore clear that there was no evidence derived from chemical examination tending to show that any deleterious organic matter was, or had within a short time been, dissolved in this water.

The sediment was too inconsiderable to be examined.

The dissolved solids consisted chiefly of lime salts (carbonate and sulphates) and alkaline chloride.

The total solids amounted to 17·5 grains per gallon.

The hardness was—

	Clark's Scale.	
Total	11°·55	1° = 1 grain of carbonate of lime per gallon.
Permanent	7°	
Removable	4°·55	

The lime salts and chlorides made up almost the entire amount of the total solids.

I conclude then, that at the time of examination (9th March) there was no evidence that this water was deleterious.

No. 2. *Gymnasium Well.*

No. 3. *Hospital Well.*

The water of these two wells was found to be precisely alike. The water evidently comes from the same strata. Both were clear, bright, tasteless, and without sediment.

There was very slight evidence of nitric acid; no nitrous acid; hardly a trace of ammonia; oxidisable organic matters in about the same proportion as in No. 1 well water, and slightly more chlorine.

The composition was as follows, in grains per gallon:—

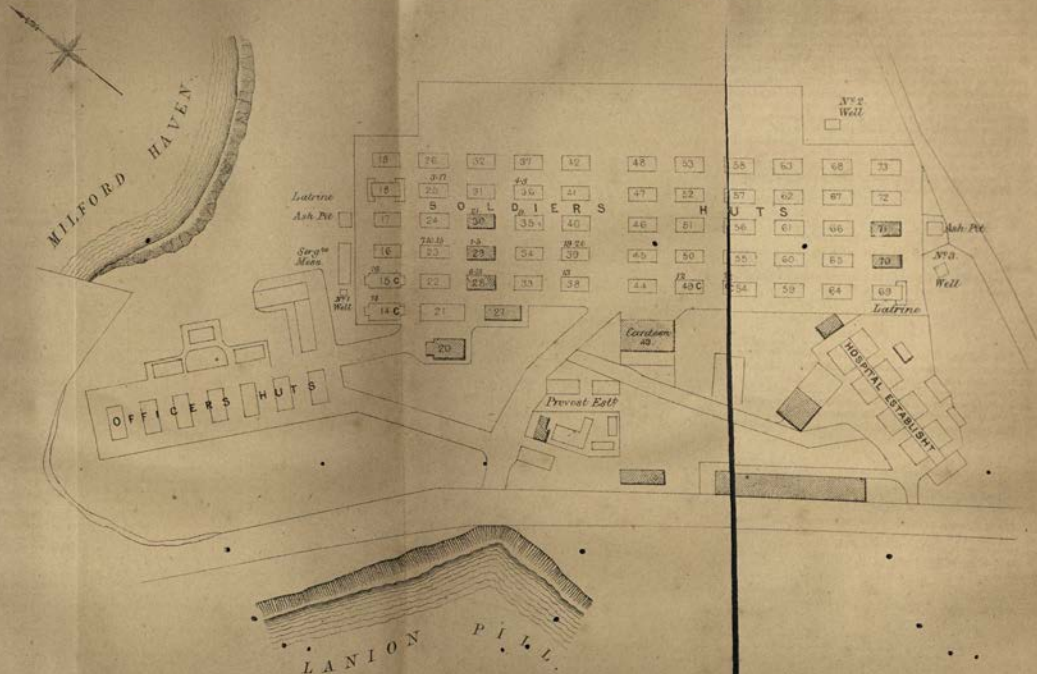
	No. 2.	No. 3.
Total solids	35	35
Oxygen required per gallon	·0098	·0098
Chlorine	4·871	4·871
Total hardness	16°·8 Clark's Scale.	16°·8

The difference between these waters and No. 1 was that they contained more lime salts and more chlorine; but the evidence of oxidizable and oxidized organic matters was almost identical.

Neither water contained anything which could be considered prejudicial to health.

* A sample of the water procured a month later contained ·0023 grains of free ammonia per gallon, determined by distillation.

THE NUMBERS WRITTEN OVER THE HUTS SHEW CORRECTLY THE ORDER OF SUCCESSION OF EACH CASE.



APPENDIX No. X.

REPORT ON THE EPIDEMIC FEVER AT TRINIDAD, WEST INDIES, 1869.

By Staff Surgeon J. Crosse Johnston, M.D., Senior Medical Officer.

For the purpose of showing the circumstances under which the epidemic of this year made its appearance, a brief outline of the physical geography and medical topography of the locality is given. Trinidad differs much from the other Antilles. It is not an island in the same sense that the isolated peaks of submarine mountain ranges are islands, but a fragment of a great continent which a physical change has caused to be surrounded by water. It is adjacent to the main land of South America, and its fauna and flora are almost identical with those of the neighbouring shores, from which, at no very remote period, it has been separated. To the south-west lies the great delta of the Orinoco, presenting an irregular coast-line of about 200 miles in extent, and abounding probably in sources of paludal fever. Almost inaccessible, and but scantily inhabited on the north, south, and eastern shores, the western coast is that with which we are mainly concerned, as the seat of government and commerce and the residence of the troops. This side of the island embraces, by promontories at its north-western and south-eastern angles, the Gulf of Paria. The waters of this land-locked sea, brackish, turbid, and laden with organic matter, are mainly derived from the many mouths of the Orinoco, and communicate with the Atlantic Ocean on the south and the Caribbean Sea on the north, by narrow straits only a few miles in width. Trinidad possesses three mountain ranges, but, unlike the majority of the West Indian Islands, presents the aspect of a level rather than a hilly country. The northern mountain range, parallel with and adjacent to the coast, has an average elevation of 1,500 to 2,000 feet. Two spurs, running in a southerly direction near its western extremity, encircle an irregularly-shaped plain from one to two miles broad, and nearly three and a half miles in length along the coast. Within the limits of this plain, which has an area of 2,500 acres, are contained the capital town, Port of Spain, the military barracks, &c. It is traversed about its centre by the Mucaropo River, which drains the valley of Maraval, situated to the north of the barracks, and on the east by St. Anne's Ravine, or "Dry River," containing water only during the rains. This ravine is of considerable importance in a sanitary point of view, for it skirts the town from north-east to south-west, and is the depository of much filth and garbage, which, mingled with sea-water at the mouth, creates a noisome stench. Along the sea-shore, especially at the mouth of the Mucaropo just mentioned, are several small swamps. In fact, a narrow belt of coast from one of the boundary spurs to the other is more or less marshy. An extensive swamp reaches close to the town on the south. Through it meanders the river Caroni, which has its mouth about two miles from Port of Spain. West of the town, at the mouth of the river Diego-Martin, is another extensive swamp, distant about four miles. The plain just described is sheltered from the east to the north-west by mountains and hills. It is open to the south wind, and in a less degree to the south-east, south-west, and westerly winds. During about seven months of the year the prevailing wind is from east to south-east; during three months and a half from north to north-east; and during about six weeks from west to south-west; rarely or never from north-west.*

Dr. de Verteuil.

The duration of the prevailing winds has a very important practical bearing. The easterly and south-easterly winds are cool and agreeable, but having swept over the great Caroni Swamp are saturated with paludal miasmata; and these breezes, it will be observed, blow for more than half the year. The westerly and south-westerly winds blow over the plains of Venezuela and the Delta of the Orinoco, are accompanied by heavy showers, and are hot and oppressive to a degree. The north wind, which is cold and chilling, is much dreaded by the inhabitants, and brings down upon the barracks and military hospital adjoining exhalations from the redundant vegetation of the Maraval Valley. The harbour of Port of Spain, where no barrier intercepts the free sweep of the wind, is ordinarily healthy, although exposed to the full current of the easterly and south-easterly winds, which are, as explained, malaria-laden. The seasons in Trinidad, like those of all tropical countries, are of course but two—the wet and the dry. The "dry" extends from January to May; the remainder of the year, the season of the south-easterly winds, is the "wet" season. In July and August the rain falls in torrents, and very heavy rain-fall is not unfrequent in November. The commencement of the wet season is to some extent coincident with the beginning of the sickly season, somewhat in opposition, it may be noticed, to the observations which have associated paludal fever with exhalations developed during the "drying up" succeeding the cessation of the rains. Amongst the causes operating injuriously to health at the commencement of the rains, it is not difficult to believe that large quantities of organic matter accumulated during the drought must, on the onset of the rains, be swept down the watercourses to mingle with the water employed for domestic purposes, and also be deposited to putrify in the sun, when the suddenly swollen streams overflow their boundaries. The plain of which the foregoing mention has been made is composed of alluvium washed from the neighbouring hills, or deposited by the St. Anne's and Mucaropo Rivers, and has also been formed, to some extent, by deposits from the waters of the Gulf. The surrounding hills—clothed almost throughout with virgin forest, dark, impenetrable, and unventilated—are composed of mica, schist, sandstone, limestone, and shale. The slope of the plains, from the base of the hills to the sea-shore, is at the rate of about 60 feet in the mile. With this great natural advantage to aid a complete system of sewerage and drainage, no efforts have been made in this direction, excepting a partial and abortive one in Port of Spain, and that in operation at the barracks.

If to the foregoing sketch be added the statement that only 6·57 of the whole island has been brought under cultivation, and that the remaining 93·43 is covered with marsh, forest, and copsewood, a very general but perhaps sufficient notion of the medical topography of the immediate locality may have been conveyed.

The barracks of St. James were erected at great cost, and are a fine pile of buildings, unhappily situated just opposite to the Maraval Valley, with an exposure to the north wind, and in dangerous proximity to the cocorite swamp. The ground in the vicinity slopes upwards towards the hills on the north and north-east, and is for the most part covered with brushwood. The land to the east is under cultivation for sugar-cane. A competent system of drainage and sewerage is in operation, and the insanitary conditions are almost confined to the faulty situation.

Not many years since, the barracks were visited by epidemics at times when the town and neighbourhood were free from disease. Since the introduction of sewerage a change has taken place in the relative healthiness of the localities. In the instance of the epidemic under consideration, whilst in the town there was much fever with a high rate of mortality, at St. James's Barracks there was, it is true, also much fever, but a very slight mortality. Many causes may have contributed to this happy immunity. Amongst them are perhaps the fairly good sanitary condition of the barracks, more particularly as contrasted with the highly insanitary state of Port of Spain; the moderate amount of labour devolving on the troops, the regularity of their meals, and character of their diet; the early period of attack at which they were subjected to treatment, their temporary removal to an encampment, and the facilities afforded by a military hospital for the efficient treatment and constant supervision of the sick. As a set-off against these advantages must be mentioned

very general over-indulgence in stimulants, more particularly in the form of ardent spirits, against which indiscretion arguments and entreaties are of no avail, in the absence of occupation and amusement for mind and body. It will readily be understood that paroxysmal fever is the prevailing disease of Trinidad. Periodic fevers, intermittent or remittent, are endemic throughout the year in parts of the island; and regular epidemics are liable to recur at certain periods, generally at a change of season; but these affections here, as in other places, are found to be much modified by various circumstances. In the later epidemic, considerable diversity of form was observable in fevers of the paroxysmal and continued types, as exhibited under different circumstances and in different individuals. The general tendency of ague, when present, appeared to be to pass into remittent, and remittent into yellow fever; and each of these diseases presented deficiencies and anomalies in their symptoms. Instances in which the remissions were persistent and well marked were by no means common, and cases in which definite paroxysms were present at the outset showed very generally a disposition to pass into continued fever of a typhoid character. To find a general title which shall stand for the variety of fever seen in this outbreak is of course impossible, but the prevailing type is not inaptly represented by the term "typhoid bilious remittent," proposed by the Surgeon-General of the Colony. Perplexed by the great and sudden prostration which tended to hurry certain cases to a fatal termination, practitioners, despairing of a more exact designation, were content, in some instances, to return the disease as "malignant fever"; and however indefinite and unsatisfactory such a name must be admitted to be, there is still some excuse for its employment. The paroxysmal character, never very well marked, was for instance, say, altogether obscured. There might have been yellowness of the skin without black vomit, or black vomit without yellowness of the skin, and the aggregate of the symptoms did not appear perhaps to justify the title of yellow fever, but the disease required some name. Neither "intestinal complication," "mulberry rash," nor "rose spots" were present to suggest typhus or typhoid. There was a well-pronounced malign tendency. For lack of a better title, the case was returned as one of "malignant fever." That fever of a mixed description should prevail will appear but natural, when it is known that in Port of Spain we have habitually present the conditions needful for the development of pythogenic fever. Some of these are thus briefly described by the Superintending Sanitary Inspector:—"Ill ventilated, over-"crowded dwellings, cesspools, heaps of rotting filth in the yards, stinking "gutters in the street." And to these may be added a partial and imperfect system of sewerage, which is a prolific source of disease, instead of, as it was intended to be, a conservator of health; a muddy shore, washed by a shallow sea and stirred by feeble tides, which on their subsidence leave behind disgusting odours; and finally a population composed, for the most part, of ignorant black and coloured people of filthy habits. From the first the anomalies exhibited in the late epidemic impressed upon me that, as we had present the agencies which produce both paroxysmal and continued fever, so we had the symptoms suggestive of both forms of disease co-existent at times in different patients and in individual cases. When the distinction was established between specific and malarious yellow fever, a great benefit was conferred upon practitioners in the western tropics, who were thereby relieved from many perplexities of diagnosis. Few facts are better recognized among medical men in this colony than that they have frequently seen remittent fever pass into yellow fever, or what they would have called yellow fever, had they not been checked by passages similar to the following:—"The progress of enquiry has entirely "disconnected true yellow fever from malaria." "The two agencies of yellow "fever and paroxysmal fever are entirely distinct." "As more care is taken, "the symptoms of the two diseases are also found to be diagnostic."* Unless it were admitted that two kinds of fever "entirely disconnected" might follow each other in one case of sickness, there was no apparent possibility of reconciling such statement with the facts under their observation. The determining of a variety of true yellow fever having its origin in the same source as paludal fever, afforded at once a satisfactory explanation of their difficulties. Premising

* Dr. Parkes.

that the diagnosis between specific contagious yellow fever and the malarious form of yellow fever is at all times difficult, Dr. Aitkin, in his very valuable work on Medicine, suggests certain diagnostic indications by which an attempt at discrimination may be made. Those to which he attaches most importance are, that in malarial yellow fever there is non-contagion, absence of suppression of urine, and absence both of blood and of albumen in the urine. To further elucidate this very interesting point, I have attempted to collect in a tabular form, from the same authority, the more important symptoms of the two diseases :—

Specific Yellow Fever.	Malarious Yellow Fever.
Probably a history of contagion. (Immunity from second attack.)	Malarious origin. No history of contagion or of communicability.
Slow or intermittent pulse; continuity.	Continuity; exacerbation and remission indistinguishable.
Yellowness of skin and conjunctiva.	Yellowness of skin and conjunctiva.
Suppression of urine.	Non-suppression of urine.
Albumen in urine.	Urine non-albuminous.
Blood in urine.	Absence of blood in urine.
Supra-orbital headache.	Intense headache.
Delirium.	
Intense surface heat.	
Pain and anxiety at epigastrium.	
Black vomit.	Black vomit.
Black stools.	
Intestinal hæmorrhages.	Absence of hæmorrhagia.
Insusceptibility to the beneficial influence of quinine.	Susceptibility to the curative influence of quinine.
Tongue red at tip and edges; papilla prominent, and surface creamy.	
Marbled markings of the skin in the late stages, and the occasional sequela of bloody faruncles.	

Bearing in mind the existence of these conditions, it will be found that we have lately had under notice, in this locality, the following varieties of fever, partially concurrent or sequent :—1. Simple continued fever ; 2. Ague ; 3. Remittent fever ; 4. Malarial yellow fever ; 5. Specific yellow fever. The existence of the last-named disease is beyond reasonable doubt, and is illustrated by the cases of certain ladies of which the following outline is given :—

Rather more than a year since, fifteen ladies of the Dominican order of nuns arrived in this country from France to assume the duties of nurses at the Leper Asylum at Cocoriti, and to take charge of the Poor Asylum at Ariapita. The former of these institutions is very unhealthily situated, close to the Cocorite Swamp, about a mile to the westward of the Barracks ; but its inmates had been, notwithstanding, unusually free from attacks of fever from the commencement of the epidemic in February to the period at which the nuns were attacked in September. The district called Ariapita is a part of the town situated on the sea-shore. It lies very low, is undrained, receives much of the surface-water of the higher parts of the town, and is so permeable that on occasions water is seen springing up from the soil ; and it is known that some of the privies never require emptying, the contents percolating through and becoming disseminated in the soil. Lastly, the insalubrity of the locality is completed by the presence, in the margin of the sea, of a large slaughter-house, from which is exhaled the most noxious odour.

The first attack occurred in one of the ladies at Ariapita. She was removed for change of air, accompanied by two of the sisters from Cocoriti, and recovered. On returning to their duties, one of the latter took sick and died. The first mentioned had a second attack, and died also. With the exception of those absolutely necessary to perform the duties of the two institutions, the nuns

were then removed to one of the group of small islands in the Gulf of Paria, to which the inhabitants of Trinidad are in the habit of resorting for change of air and sea-bathing. In four days one of their number returned from the island to Cocoriti with fever, and from this point the disease spread rapidly amongst them. In all, eleven were attacked and nine died. Their physician considers that the principal disadvantages peculiar to their position were—their comparatively recent arrival from a temperate climate; the austerity of their lives; the resolution which caused them to nurse each other, to the exclusion, as long as possible, of extraneous aid; and the texture of their dress, composed of woollen fabrics calculated to retain and disseminate the fever poison. In the absence of abstracts of any individual cases of these ladies, an attempt has been made to summarize a description of the symptoms as given by their medical adviser, who states that, although individual instances presented certain differences as might be expected, particular symptoms being altogether wanting in some cases, yet so great was the general resemblance that a comprehensive description can be given which shall represent the whole with tolerable accuracy. The following is an epitome :—

First Period.—Pulse 80 to 100, never exceeding the higher figure, small and compressible in most instances; rigors intense; deeply-seated headache; articular pains; rachalgia ("le coupe de barre"); redness and tumefaction of *the face; eyes red, brilliant,* and having an appearance of undue prominence; intolerance of light; tongue red at tip and edges, moist, and covered with a white fur; thirst, and desire for cold drinks; constipation, followed by black and fœtid stools; skin dry and burning, especially at the forehead and epigastrium (?); urine not diminished in quantity, slightly reddish, sometimes albuminous, in other instances non-albuminous. After 15 or 20 hours, great pain and burning at the epigastrium, sometimes accompanied by vomiting of bilious matter or glairy mucus.

Second Period.—Yellowness of the skin, varying from a discoloration of the upper part of the trunk to a deep yellowness of the whole body and of the conjunctiva; an abatement of the painful symptoms; skin moist; pulse fallen to 50, or even 30; an apparent but deceptive amelioration, called by the Spaniards "Lo nujor de la muerte." Subsequently there is a vitiation of the taste, and a feeling of such distension at the epigastrium that the patient refuses all drinks, or takes them with repugnance. Anxiety, jactitation, hiccough, black vomit, suppression of urine, failure of the pulse, and death. When the termination was of a lingering character, violet patches of effused blood were seen on the lower extremities and nates.

Exceptional Cases.—In one case, which proved fatal in five days, there was no black vomit. In another fatal case, great excitement and delirium were among the first symptoms. It is to be remarked that the regular succession of the symptoms, as above given, was not followed in each instance. A complete or partial inversion of their order occasionally happened. The casual allusion made to the presence or absence of albumen in the urine suggests that no especial enquiry was pursued concerning this very important symptom, which is to be regretted, as diminishing the value of the Report. No mention is made of the presence of hæmorrhages other than black vomit, which is stated to have been followed, in the most severe cases, by the ejection of pure blood from the stomach. On the whole it will, I think, be admitted that specific yellow fever has in these cases been sufficiently demonstrated, with a clear and interesting history of contagion, or at least of "transportation" of the fever virus.

The treatment adopted included general and topical bloodletting; warm pediluvia; "diluent drinks," as lemonade and iced water; tepid baths; emollient and purgative injections; purgatives of calomel and castor oil; saline effervescing draughts; quinine in small or large doses as indicated, as an antiperiodic and neutralizer of malarious poison; ice in small lumps to be sucked to allay the heat and distress of the epigastrium; stimulants, chiefly champagne and brandy, the use of which was in some instances of benefit, in others of none; carbolic and phosphoric acids, neither of which are considered to have exerted any beneficial influence; and, lastly, blisters occasionally applied to the epigastrium.

Fever prevailed in Port of Spain as early as February, and yellow fever

was first seen at this time, but the mortality did not differ greatly from that of former years. It was not until June, the month in which the writer arrived, that the death-rate became excessive. The circumstances antecedent to the epidemic were an unexampled drought during the three preceding years, and great and unusual heat in the early part of the year.

STRENGTH of the Garrison, Trinidad, 1st February, 1869.

Corps.	Officers.	Men.	Women.	Children.	Remarks.
Staff and Departments ..	5	12	9	24	
D.N. Royal Artillery ..	1	20	1	..	
„ 47th Regiment ..	8	141	25	39	
Army Hospital Corps ..	..	2	..	..	
Military labourers	..	13	2	1	
Royal Engineers	1	..	..	..	
Total	15	188	37	64	

Amongst the first severe cases in the town was that of a Corporal of the 47th Regiment, employed in the bakery of the Commissariat. This, the only fatal case of fever which occurred in the garrison, originated in Port of Spain, although conveyed to St. James's for treatment. The buildings of the Commissariat establishment are ill situated and unhealthy, and have formed the subject of unfavourable reports on many previous occasions. The ground adjoining on the west was reclaimed from the sea by the Colonial Government. At high tide water is seen to ooze through the soil, and in the midst of the rainy season surface-water collects in large quantities and stagnates, giving rise to very evil odours. In consequence of representation made by the writer, the Local Sanitary Board have caused important improvements to be effected in the condition of this piece of land. On the west is the offensive muddy foreshore of the Gulf, of which mention has already been made. The following is an abstract of this case, given by Assistant-Surgeon Dr. Jameson, 47th Regiment :—

"No. 903, Corporal J. B., age 22, service 4 years, station Trinidad, time on "the station 6 weeks, February 20, 1869. He was employed at the Commis- "sariat bakery in Port of Spain. On the 19th he had a sense of chilliness, "pains in the limbs, headache, and general pyrexia. This morning he came "to hospital. He bled from the nose, and the hæmorrhage became so con- "siderable as to require the nostrils to be plugged. On the following day "(21st) pain in the head and febrile symptoms continued. There was a sensa- "tion of pain and tension in the region of the epigastrium, and the liver could "be felt to be enlarged. In the afternoon coagulated blood was vomited. "(22nd.) Countenance expressive of anxiety ; skin acting freely ; pain in the "epigastrium continuing ; clotted blood was vomited at three different times. "In the afternoon the eyes became much suffused, and the skin was seen to "be of a pale yellow colour ; pulse 94 and weaker ; perspiration profuse on "forehead ; tongue of a dull red colour, moist, and not coated ; bowels acting "naturally ; urine scanty, high coloured, and loaded with albumen ; a peculiar "sickly ammoniacal odour given off from the body. There is also much "inclination to delirium, but he answers questions readily and correctly. "(Feb. 23.) He slept a little during the night, and at times lies quietly without "speaking or moving. There was also an attack of vomiting in the night, "when coagulated blood was ejected as before. Large drops of perspiration on "face ; eyes much suffused and jaundiced ; tongue brown and dry ; he breathes "by the mouth ; pulse 102, soft and weak ; respiration slightly hurried ; he "complains less of pains in the stomach ; there is some delirium present ; urine "scanty and high coloured, and becomes solid when boiled ; after discharging "the contents of the bladder, blood escapes from the urethra. (Feb. 24.) No "vomiting since yesterday ; pain in the stomach not much complained of ; "delirium was present during the night, and continues ; pulse fuller than

"yesterday; tongue brown and dry; skin tinged with a straw colour, and con-
"junctiva similarly coloured; urine is passed in greater quantity, sp. gr. 1,018,
"and still contains an immense quantity of albumen; blood oozing from
"urethra after micturition. (Feb. 25.) Delirium became low and muttering in
"character last night, and subsultus tendinum was marked; urine secreted in
"fair quantity, escaped involuntarily; this morning it is scanty, and a small
"quantity drawn off by the catheter became almost solid when boiled; coun-
"tenance becoming livid; tongue dark brown and dry; sordes on teeth;
"purple spots on legs. During the course of the day debility increased. He
"refused all nourishment or medicine, but swallowed at intervals a small
"quantity of brandy and water. Owing to much subsultus tendinum, the
"pulse could not be felt at the wrist. He gradually sank, and died at 7·15 P.M.
"Immediately after death the skin became intensely yellow; black-coloured
"fluid escaped from the mouth and nose. The body was wrapped in a shirt
"saturated with carbolic acid, and, as a precautionary measure, buried the
"same evening. For the same reason there was no *post-mortem* examination."

Dr. Jameson adds the following remarks:—"On admission, the case was
"considered to be one of severe continued fever combined with hæmorrhagic
"tendency, the hæmorrhagic symptoms predominating. The bowels were
"moved, after which a simple diaphoretic mixture was prescribed, and ice
"given by the mouth. The nose was plugged. Blood continuing to be
"vomited, acetate of lead and opium were given; hæmorrhage continuing,
"tinct. ferri. per. was substituted, but of course without benefit to the disease.
"As soon as the symptoms indicated an undoubted case of yellow fever,
"calomel and quinine (20 grs. of each) were given; and on the 23rd, carbolic
"acid in two-drop doses was given every hour, and the same medicine diluted
"was injected hypodermically three times daily. Blistering fluid was applied
"to hypochondrium, and stimulants resorted to. After the first dose of carbolic
"acid, vomiting ceased, and did not again take place; and for a short time
"there was an improvement in the condition of the patient, but appearances
"were delusive and the treatment failed."

Dr. Jameson was induced to try the effects of carbolic acid in the treatment of yellow fever by rumours of its success at St. Kitts, and also from its reported use in the epidemic at the Mauritius; and adds, "In subsequent case occurring "in Port of Spain it again failed." The existence of hæmorrhage, and large quantities of albumen in the urine, with the symptoms generally, demonstrates this to have been a case of true specific yellow fever. The disease was not, however, disseminated; and the seventeen cases of fever occurring amongst the troops during the months of February, March, and April were returned under the head of simple continued fever. Of this disease, Dr. Jameson gives this description:—

"The symptoms were as follows:—Discomfort, chilliness, weariness, pains
"in the limbs, followed by headache. (The pain referred to the front part of
"the head is never absent; pressure on the eyeballs also increases the pain.)
"Tongue is coated with a light-brown fur, and is clean at the tip and edges;
"pulse varying in rapidity and strength in different cases and periods of disease,
"from 48 to 120, usually accelerated for 24 hours, and then suddenly falling
"40 or 50 beats; countenance usually dingy, and having a depressed expres-
"sion, but sometimes flushed; eyes dull and suffused: conjunctiva injected;
"nausea usually present, followed occasionally by bilious vomiting; skin hot
"and dry; urine scanty, deep coloured, and of high specific gravity. These
"symptoms continued for 18 or 24 hours. The skin then becomes moist,
"headache disappears, pulse rapidly falls, tongue cleans from the circum-
"ference to the centre, appetite improves, and patient complains of nothing but
"extreme debility. Convalescence goes on uninterruptedly, and usually with-
"out a relapse. In a limited number of cases there was a tendency to a return
"of the disease, after an interval of several weeks. In two months one man
"was attacked three different times, each attack being more severe than the
"one preceding; and it was necessary to send him to Barbadoes for change of
"air. The features of this malady, at least as seen by me subsequently to the
"period here spoken of, presented occasionally a gravity of character that
"suggested something beyond the 'ephemera protracta' of systematic writers.
"I cannot but suspect a malarious origin, although the exhibition of quinine

" was not followed by any beneficial effects, nor were remissions to be detected " as far as my opportunities for observation permitted me to judge. The in- " tensity of the headache was a striking characteristic of each case, and the " whole inclined to the position of 'doubtful cases seen to occur in places " 'where yellow fever and remittent fevers occur, and which cannot be classed " 'as either one or the other form of fever.'* Unfortunately observations on " the co-relation of temperature could not be made, as there are no clinical " thermometers in possession ; nor are there any instruments for meteorology. " This latter deficiency I have however been able to supply, to some extent, by " the courtesy of a friend. With the change from the dry to the wet season, " about the end of May, occurred a corresponding change in the character of " the fevers admitted. Falling no longer within the category of continued " fevers, inasmuch as the symptoms were of much greater severity, and indi- " cations of periodicity were more or less observable in them ; they were classed " as cases of remittent fever. The chief difference between them and the febrile " attacks just mentioned consisted in the occasional presence of evening exacer- " bations (which were possibly often present, but from press of circumstances " occasionally escaped observation), the suddenness of attack, and the complete- " ness of the accompanying prostration. Articular pains and much vachalgia " were complained of. In addition to being scanty and high coloured, the urine " frequently contained albumen. Sleeplessness was very often present, and " occasionally an eruption somewhat resembling 'prickly heat,' but less ele- " vated and sharply defined. Lastly, convalescence was interrupted by a " tendency to relapse, after about a week or ten days. Of such cases, nine were " admitted in May, with four of simple continued fever. It appears that there " are certain points of resemblance between these cases of remittent and that " kind of fever known as 'relapsing fever,' and sometimes described as 'bilious " remittent.' Notably the suddenness of attack, severe frontal headache, nausea " or vomiting of a bitter fluid, excessive muscular and articular pains, and much " pain in the back ; profuse perspiration, with little or no relief of the other " symptoms ; sleeplessness ; the occasional appearance of an eruption (which, " however, resembles 'lichen tropicus' rather than 'miliary vesicles' accredited " to relapsing fever), and the tendency to relapse. Points of difference were of " course also present, but not to such an extent, I think, as to invalidate a " pretty general resemblance. After an interval of more than four months, the " second case returned as yellow fever occurred in St. James's Barracks. On " the 2nd of July the first of these cases was admitted ; and on the 4th, two " additional cases making their appearance (one from a barrack-room, the other " in a married man from a Coolie hut in the neighbourhood), I represented " to the Commanding Officer the desirability of evacuating the barracks, and " encamping the troops on the Queen's Park or Savannah, distant about three- " fourths of a mile to the eastward. The garrison accordingly took up their " residence under canvas on the 6th of July, and the barracks were taken over " by the Royal Engineer for the purpose of 'stopping, scraping, and lime- " washing.' As a direct means of diminishing the number of sick, the change " was not so useful as might have been anticipated. This circumstance is pro- " bably attributable to the rains, which caused unavoidable dampness and " deterioration of atmosphere by compelling frequent closure of the canvas, and " partly to the fact that in camp the men drank freely. The tents were " double, of excellent quality, and not overcrowded, but five men being allotted " to a bell tent. In consequence of irregularities of the ground, the outfall of " the Queen's Park proved insufficient to carry off the water from the camp " drains during heavy rains, and some surface accumulation occasionally fol- " lowed. An attempt at taking up fresh ground, on the 20th July, was followed " by a misadventure in which the whole of the bedding became saturated, with " the exception of that belonging to the Royal Artillery. The men were " therefore removed to the shelter of a neighbouring public building for the " night, and on the following day returned to barracks. Only one room had, " however, undergone the specified detergent processes, in consequence of the " paucity of labour at the disposal of the Engineer Officer, it having been " thought inexpedient for the troops, all of whom were more or less out of

* Aitkin.

"health, to be marched backwards and forwards from the camp several times "daily, exposed to sun and rain, for the purpose of cleaning the barracks. "Under these circumstances, a small encampment within the barrack enclosure "was occupied by the men of each room successively, whilst their quarters "were being scraped, limewashed, and fumigated. This process, although "enjoined by Regulations, was of but slight importance, as no case of specific "contagious yellow fever originated in the barrack-rooms. The cases admitted "from the camp during the 16 days of its occupation (exclusive of 11 cases of "a slight character treated in the hospital marquee in camp on barrack rations, "and who were not introduced into the returns), were as follows, viz. :—

	Cases.
Simple continued fever	1
Remittent fever	10
Yellow fever	6
Total	17

"The admissions from fever during the 16 days following the return to "barracks were as follows, viz. :—

	Cases.
Simple continued	3
Remittent fever	22
Yellow fever	4
Total	29

"From the 4th July to the 6th October, the fever cases were all treated in "marquees erected within the barrack enclosure, instead of in the hospital "wards. I am inclined, on the whole, to think favourably of this procedure, "the more so that the men appeared to have an objection to the hospital "building; for they conceived, and apparently with truth, that fever cases "originated within its walls. There is, it may be stated, no obvious insanitary "condition to which this may be traced. The climate and malarious poison "appeared to have originated fever there as in the barrack-rooms, probably "neither more nor less. Some disadvantages connected with the treatment of "the sick under canvas cannot be ignored. At certain times of the day, shade "could not be associated with sufficient ventilation; and at night, when heavy "dews and mists compelled the side walls to be let down, a very close and "unwholesome atmosphere was soon generated. The air in the marquees on "rainy days was also speedily vitiated. The space between the pieces of "flooring was made too often, I fear, the receptacle for slops and other super-"fluities. The amount of labour involved in attendance on the sick was also "appreciably increased. Medical appliances could not be made so readily "available, and other difficulties existed not to be met with in a permanent "building. In a tropical climate, matters elsewhere of little importance become "occasionally sources of serious inconvenience.

"The cases in which much albumen, hæmorrhage, yellowness of skin, or "black vomit were present, were returned as yellow fever—an arrangement also "adopted by the Surgeon-General of the colony, whose experience is excep-"tionally large. Those cases in which even imperfect remission could be "observed, and in which the symptoms of blood poisoning were less pro-"nounced, and the urine was free from albumen, were returned as 'remittent,' "and those having no appreciable paroxysmal tendency, and in which the "symptoms were of still less severity, as 'continued fever.' Whilst admitting "that the term 'remittent,' as thus employed, may be objectionable, as "indefinite and tending to confusion, it does not seem obvious what substi-"tute could be made with only the existing nomenclature as a guide. That "the different forms of fever thus designated, even including those returned "as continued fever, had a common malarial origin, may be looked upon as "certain—the tendency being, for the cases described as 'remittent,' to pass "into continued, those of continued fever into yellow fever, and the latter into

"ague; and those forms were to be seen either concurrently in individuals "who were subjects of several attacks during the season, or in different cases "admitted successively. The pathological fact of greatest import would seem "to be connected with the symptoms regarded as diagnostic between yellow "fever proper (specific contagious yellow fever—fever which may be conceived "to be a combination of pythogenic with malarial fever), and non-communi- "cable malarious yellow fever. 'The diagnosis,' says Dr. Aitkin, 'between "'specific contagious yellow fever and the malarious form of yellow fever is "'at all times difficult; and severe marsh fevers in certain geographical limits, "'have a close resemblance to contagious yellow fever; but they are not con- "'tagious, and urinary and blood symptoms do not occur in them,' that is to "say, there is neither suppression of urine, albuminous urine, blood in the "urine, or other hæmorrhages. If the presence of these symptoms could be "regarded as determining the presence of specific yellow fever, then we should "have had, during the late epidemic, that disease developing out of paroxysmal "fever of undoubted malarial origin.

"Two cases, and only two, of specific yellow fever occurred in barracks: "both had been imported into it, and both proved fatal. The first occurred in "a corporal of the 47th Reniment, and has already been detailed; the other in "the person of a woman not belonging to the garrison, who, being employed by "the late Commandant as a cook, had been permitted after his departure to "occupy, as a temporary arrangement, a room under his quarters, which form "an isolated building. This woman, who had been in attendance upon a fever "case in Port of Spain, was seized with specific yellow fever and died. All "other cases returned under this head were of malarial origin, but presented, "as a rule, either albuminous urine, suppression of urine, or hæmorrhage. "By a careful enquiry I have ascertained that albuminous urine frequently, "suppression of urine less frequently, and hæmorrhagia occasionally, were "observed in the colonial hospital and in private practice in the island, in "cases which in other respects resembled malarial fever, and appeared to have "a malarial origin. These symptoms cannot therefore be always relied on in "attempts to discriminate between malarious and specific yellow fever.

"Quinine was found to have no curative influence in the cases of malarial "yellow fever in which it was tried. On the contrary, from my own observa- "tions and those of others, I should say, its administration aggravated the "symptoms: thus another method of distinguishing between this malady and "specific yellow fever proved inefficacious. The cases returned as remittent "fever, in which, as has been said, the paroxysms were for the most part ill- "marked, and 'the exacerbations and remissions were (generally) so connected "'that the disease resembled continued fever,' were also insensible to the influ- "ence of quinine. So manifest was this that the patients dreaded its adminis- "tration, and its use as a febrifuge was altogether abandoned until a period "when the presence of distinct paroxysms showed that it might be advan- "tageously re-employed. The agues which closed the epidemic were readily "cured by this medicine however.

"The mineral acids having been recommended as tried with some success "in the malarial and pseudo-malarial fevers of South America, the Surgeon- "General, Mr Dacent, resolved to give one of them a fair trial. For this "purpose he selected the *dilute phosphoric acid, which he administered in "simple syrup in doses of 20 minims every hour or second hour, in specific "and malarious yellow fever, and in so-called remittent fever, with most grati- "fying success. To the exhibition of this acid I am inclined to attribute "chiefly the unusually favourable results of the cases occurring amongst the "troops, if the treatment of 148 cases of fever, of greater or less severity, "without a death, be entitled, as I believe it to be, to the claim of presenting "unusually favourable results.*"

Dr. Jameson thus summarizes the treatment which he usually carried out on the admission of a well-marked case of fever to the Military Hospital:—

"On admission, the patient was placed in a warm bath, and ice applied to "the head. Calomel and quinine (of each 20 grains) were given, and an action "of the bowels ensured. Dilute phosphoric acid, in doses of 20 minims, was "given in a little syrup every hour by day and night. A mustard plaster was "applied to the stomach, and afterwards blistering fluid to the right hypo-

"condrium. Cold packing in sheets was used every day while the acute "symptoms lasted, and in several cases it was employed twice a day. Dry "cupping glasses to the loins were applied once or twice daily, and repeated "while the urinary symptoms lasted. A moderate amount of stimulation was "indispensable, brandy and water being preferred."

The following illustrative cases are taken from the Case-book :—

No. 1346. Private H. B., age 20, service 1 year, time in the station 5½ months. On the morning of the 2nd July he came to hospital and asked for an aperient, but with the exception of constipation appeared to be quite well. He took a dose of ordinary house physic and returned to barracks; two hours afterwards he re-appeared at the hospital with extreme prostration. Pulse very rapid, increased heat of skin, eyes suffused, countenance dusky, severe headache. Calomel and quinine, of each 20 grains, given; cold packing; ice to head. In the evening of the same day the tongue was dry and dark brown; urine scanty, high coloured, and showing a trace of albumen. He complained of much pain in the back.—July 3. Pulse 74, but "labouring"; tongue moist, skin acting, eyes clearer, skin not so dusky, urine secreted in very small quantity. Dry cupping to the loins; during this operation the patient became insensible, and the pupils could not be stimulated by light. The head was shaved, and blistering fluid applied to the nape of the neck. Turpentine and castor oil enema administered. He rallied somewhat during the day, and recovered consciousness. Cold packing.—July 4. Suppression of urine since yesterday: the catheter draws off about a drachm of highly albuminous urine. Pupils irregular in size; answers questions correctly, but with effort; stools dark green; ammoniacal odour from skin. Dilute phosphoric acid in 20-minim doses, with a little syrup, every hour; counter irritation to right hypochondrium; cold packing.—July 5. Yesterday, after the second dose of phosphoric acid, the kidneys began to act freely, and the proportion of albumen was reduced; head symptoms disappeared; general improvement. Cold packing and phosphoric acid continued; dry cupping repeated; weak brandy and water.—July 6. Headache, nausea, no vomiting; urine secreted in fair quantity, and non-albuminous; pulse 80; treatment to be continued.—July 7. Headache relieved by cold packing; feels better; pulse 68; treatment as before.—July 10. For two days he had been troubled with diarrhœa, which has been checked with astringents. He is convalescing favourably. Phosphoric acid to be given thrice daily; the dry cupping and cold packing omitted.—July 13. He is able to walk about. Phosphoric acid omitted; to take nitro-muriatic acid, tincture of iron, and infusion of quassia.—July 14. Had a relapse, with much bilious vomiting; symptoms relieved by a purgative; debility considerable, but convalescence went on steadily after this date, and on the 20th July was discharged convalescent.

Remarks.—This was returned as a case of yellow fever, although only duskiness without yellowness of the skin is noted; but urinary and head symptoms were severe, and no remissions were discernible. If the claim to the title of yellow fever be considered to be imperfectly established, there would seem to be still less ground for deciding it to be a case of remittent fever, suppression of urine and albuminous urine, with the severity of the onset, would seem to justify the former rather than the latter classification. This was one of the cases which appeared not unlike relapsing fever, and the resemblance appeared to hold good in many other instances. The preliminary purgative by a large dose of calomel, with an equally large dose of quinine, is, as is well known, a time-honoured usage in the treatment of tropical fevers, and still finds many advocates who believe that the intestinal canal is best cleared, and the sepatic engorgement relieved, by this combination, in which the action of the calomel is supposed to be modified by the presence of the quinine.

If the result be supposed to justify the means, the practice cannot be condemned in this instance, for all the cases recovered, although those cases in which other purgatives were employed appeared to do just as well without the "heroic" dose; but it is difficult to understand what indications are to be fulfilled by its employment. In no instance did the disease appear to be cut short; and to relieve the engorgement of the liver, 5 grains of calomel would appear more likely to be efficient than 20, whilst the intestinal canal could be as satisfactorily cleared by a drop of croton oil or one-third of a grain of

podophyllin, assisted, if necessary, by a laxitive enemata. It may be asked also, if quinine was found inefficient by the physician and intolerable by the patient, in the general treatment of the disease, what could be reasonably hoped to result from the administration of a large dose of this alkaloid at the commencement of the case? The practice was, however, pursued in most instances on the very defensible ground that the satisfactory issue of so many cases showed that it did no harm, whilst it may have exerted a favourable influence of which we were unconscious. The administration of phosphoric acid was usually attended by highly gratifying and somewhat unexpected results. It appeared to relieve the headache, from which much distress was experienced, and to check the hæmorrhage tendency when present. A symptom so formidable as suppression of urine yielded rapidly to its use, and the presence of albumen in the urine appeared to be checked in a similar manner. It has been objected that it would be difficult to detect albumen in the urine of a patient to whom large doses of phosphoric acid were being administered, so that it may have continued present in the urine unobserved. Even if this were so, it cannot be considered of great importance, seeing that with the apparent disappearance of albumen from the urine was associated a general amelioration of the condition of the patient. From the process of cold packing very good results were thought to arise by promoting diaphoresis when the skin was dry and pungent, and in relieving the headache. The application of ice to the head, although sometimes grateful, was as frequently distasteful to the patient, nor did any markedly good effect appear to follow its employment unless the head was shaved, and the scalp completely enveloped in a bag filled with crushed ice. The merits of dry cupping, as a means of relief to renal congestion, require no remark.

Case 2. Disease, yellow fever. Private T. M., age 33, service 14 years, a married man living in a coolie hut in the vicinity of the barracks. On the morning of July 4 he came to hospital with much prostration; eyes suffused; face dejected, and yellowish in colour; tongue white in centre, and red at tip and edges. He stated that he was suddenly seized with chilliness and shivering, followed by violent headache. The urine was scanty. To have a hot bath, 20 grains of calomel and quinine, and ice to the head. In the evening the urine was found to contain albumen in large quantities.—July 5. Has taken phosphoric acid every hour during the night. Symptoms ameliorated; skin clearer, tongue cleaner, and a slight increase in secretion of urine. Albumen deposited in test-tube occupied half of its space. Phosphoric acid and cold packing.—July 6. Much albumen in urine, and considerable capillary congestion of skin; headache less severe; tongue cleaner; no nausea. To have blistering fluid to right hypocondrium, ice to head, dry cupping, cold packing, and continue phosphoric acid; to take brandy and water.—July 7. General amelioration; pulse 67; urine secreted in fair quantity, but is highly albuminous and mixed with blood. Continue treatment.—July 8. Urine less albuminous; general improvement of symptoms. Phosphoric acid to be given three times a-day; cold packing and dry cupping to be repeated.—July 13. Urinary symptoms disappeared; patient convalescent. Iron and magnesia mixture.—July 15. He is sleepy; complains of general malaria; tongue slightly coated.—July 16. Has had a relapse; the symptoms are similar to those on admission, but aggravated in intensity; pulse feeble and compressible; urine very scanty, high coloured, and albuminous. Treatment as in first instance; dry cupping, cold packing, and phosphoric acid.—July 17. Quantity of albumen lessened; great general improvement.—July 18. Progresses favourably. Acid four times daily; omit other treatment.—20th. Improves. 6 grs. quinine three times daily.—29th. Regains strength slowly; discharged convalescent.

Case 3. Disease, yellow fever. Serjeant J. P., age 28, service 10 years. July 9. Admitted from the camp with nausea, prostration, rapid pulse, violent headache, face flushed, and eyes suffused. To take two-thirds of a grain of podophyllin, to have a warm bath, ice to head, and the following draught every second hour for the present:—Dilute phosphoric acid, 20 minims; nitric spirits of æther, 1 drachm; quinine, 10 grains.—July 10. Face flushed, severe headache, ringing in ears, intolerance of light, urine very scanty, skin hot and pungent. Mixture, quinine; continue acid, dry cupping, and cold packing.—

July 11. No improvement, much albumen in urine, nausea and sleeplessness. Continue treatment.—July 12. Much vomiting of a dark-coloured liquid, accompanied by dejectures of the same character; is feeble; vomits the acid, which is to be omitted. To have brandy and water, and to take 5 grains of bismuth every fourth hour.—July 13. Vomiting ceased after two doses of bismuth; considerable general improvement; urine still highly albuminous. Repeat cold packing and dry cupping; phosphoric to be resumed thrice daily.—July 14. Only a small quantity of albumen now present in the urine; general improvement. Omit acid; to take quinine and sulphate of magnesia mixed; repeat cold packing and dry cupping.—July 22. Discharged convalescent.

Remarks.—The vomiting in this and other instances yielded readily to the administration of bismuth. The foregoing was a very severe case, and the patient suffered excessively from frontal headache. In this case, as in others, the patient had a dread of quinine as an anteperiodic, during any part of the stage of febrile excitement, in consequence of the aggravation of the headache caused by it. It was thought highly useful at a subsequent stage, however, combined with small doses of sulphate of magnesia. It is obvious that the administration of quinine as a febrifuge should be restricted to instances where something like distinct remissions are discernible; but instances are not wanting in which it has been advantageously employed in fevers of a continued rather than of a remittent type, when of an origin undoubtedly malarious. It did not prove efficacious until the close of the epidemic, when ague had superseded the graver form of fever, and then it exhibited its usual powers.

Case 4. Disease, yellow fever. Corporal W. S., age 22, service 4 years. July 29. He felt ill yesterday in his barrack-room, and came to hospital this morning with severe pyrexia, face flushed, tongue brown, and red at tip and edges, with elevated papillæ. To take podophyllin, half a grain; quinine, 20 grains. Warm bath.—July 30. Pulse 90; increased heat of surface; tongue creamy in the centre, red at the circumference. Phosphoric acid to be administered every hour, dry cupping to loins, and wet packing.—Aug. 1. Last evening there was a remission, to-day there is an exacerbation; bowels torpid. Castor oil purge; ice to the head; continue remedies.—Aug. 2. Symptoms severe; urine albuminous, scanty, and high coloured; epistaxis at intervals; skin covered with a rubeoloid rash on yellow ground. Cold packing and dry cupping; repeat phosphoric acid every hour.—Aug. 3. Epistaxis continues; much fever; fulness and tenderness at right hypocondrium; blistering fluid to be applied to that region.—Aug. 4. Epistaxis ceased; skin remains yellow; tongue moist, and covered with brown fur; pulse 72; much headache; face flushed.—Aug. 5. The quantity of albumen in the urine diminished; much debility. To have brandy and water.—Aug. 6. Hæmorrhage not renewed; urine only slightly albuminous. Continue treatment.—Aug. 7. Urine normal. —Aug. 19. Discharged convalescent.

Case 5. Disease, yellow fever. Private J. K., age 24, service 1 year. Aug. 2. The patient, who has lately been very intemperate, was admitted to-day with violent febrile symptoms; skin hot, and covered with an eruption similar to that in the last case; much frontal headache. Podophyllin, two-thirds of a grain; quinine, 20 grains; to have a warm bath.—Aug. 3. Severe pyrexia continues; skin yellow; urine slightly albuminous, and very high coloured; epistaxis and hæmorrhage from the urethra. Cold packing, dry cupping, and 20 minims dilute phosphoric acid every hour.—Aug. 4. Epistaxis ceased, but bloody discharge from urethra continues; urine less high coloured, but albuminous. Continue treatment.—Aug. 5. No hæmorrhagia; secretion of urine more copious; general improvement.—Aug. 6. Urine no longer albuminous; yellow colour of skin fading. To take sulphate of magnesia and quinine mixture.—Aug. 23. He has been taking iron and acid mixture for some time past; is discharged convalescent.

Case 6. Disease, yellow fever. Private M. O'B., age 31, service 11 years. This man was admitted to hospital on the 11th July with facial contusion, and on the 26th inst. he developed symptoms of fever. In this instance, although the term remittent was applied to his case in default of a better, the remissions were indistinct; and, in addition to the usual symptoms, albumen was present in the urine. He was treated with phosphoric acid and the other adjuncts,

and discharged to light duty on the 4th August.—August 24. Having voluntarily attended upon a female who is already stated to have died of specific yellow fever in the Commandant's house, he was a second time admitted with fever on this date. This woman, a Mrs. A., had been for three days in attendance upon a lady of the garrison residing in Port of Spain, whom I also visited professionally during a severe attack of yellow fever, accompanied by albuminous urine and black vomit. Mrs. A., who was unhealthy and debilitated, got wet through in returning to barracks on the last occasion, and was seized the following day with rigors, &c. No history of contagion could be traced other than what may have been involved in attendance upon the lady above mentioned, and who certainly had not specific contagious yellow fever. A woman who washed the clothes of the deceased was also attacked by fever, and, as I am informed, not less than five other persons who had taken a more or less active part in attending upon Mrs. A. Not being resident at the barracks, I had no opportunity of following their medical history; but although the character and duration of their cases exhibited considerable variety, none of them developed specific contagious yellow fever. M. O'B., who stated his attack to have been quite sudden, was admitted suffering from extreme prostration, excessive headache, confusion of intellect, suffusion of the eyes, and similar indications; pulse 98. To have podophyllin and quinine; warm bath.—Aug. 25. Black vomit; much pain in the back; urine scanty, high coloured, and containing 50 per cent. of albumen. Phosphoric acid every hour; counter irritation to epigastrium; cold packing and dry cupping.—Aug. 26. Since the exhibition of phosphoric acid the vomiting has ceased; larger quantity of urine secreted, of a clearer colour, and non-albuminous; considerable general improvement. Treatment continued.—Sept. 2. Discharged to light duty.

Remarks.—These cases have a very general resemblance, and each of them tend to show that the presence of albumen in the urine is a symptom in no way peculiar to the specific as opposed to the malarious form of yellow fever. The remissions were usually so indistinctly marked that scarce any reference is made to them, and the cases are classed as remittent or yellow fever according to their gravity, as already explained. It may be remarked that another name seems required for grave malarial fever without appreciable paroxysms. It seems anomalous to speak of that as yellow fever in which the yellowness is occasionally hardly discernible, and is in no way diagnostic when present, and hardly less so to characterize cases without remissions as remittent fever.

The absence of any systematic attempt at bringing the foregoing cases under the influence of quinine may excite notice. In the treatment of patients in the Colonial Hospital, in private practice, as well as in the Military Hospital, it was observed as a peculiarity of the epidemic that not only, as a rule, did quinine appear not to exert its usual beneficial effects, but its exhibition tended to aggravate the sufferings of the sick, as already mentioned. Somewhat incredulous at first on this point, I administered it when opportunity offered at the periods of least appreciable febrile excitement, in certain cases attended by me in Port of Spain, with the object of increasing my acquaintance with tropical fevers, and in no instance with satisfactory results until towards the subsidence of the epidemic.

As in the phosphoric acid was conceived to have been found a remedy capable of fulfilling very satisfactorily the most important indications, the use of quinine was temporarily abandoned with the less regret.

SUMMARY of the Sick treated in Hospital.

Simple continued	19
Remittent	104
Yellow fever	16
Ague	5
Total	144

Under the head of remittents are to be found two cases in which yellowness of skin was present, two of suppression of urine, two of albuminous urine, and

two of hæmorrhage in the shape of epistaxis. The frequency of occurrence of the more important symptoms, in the sixteen cases of yellow fever, is shown in the following Table :—

Description.			Yellow Fever. (Total Cases, 16.)	Ratio per Cent.
Black vomit			3	18·75
Yellowness of skin			10	62·05
Suppression of urine			5	31·25
Albuminous urine			11	68·75
Hæmorrhage	From nares	4	7	43·75
	„ urethra	2		
	„ bloody urine	1		

The women residing at and in the vicinity of the barracks, exclusive of officers' wives, were 29 in number; of these, 27 were attacked by fever, many of them twice, and one woman three times. There were no deaths amongst these cases.

One of the children attacked was seized with convulsions, black vomit, and stupor, and died in less than 24 hours. She had previously suffered from worms.

No class of the community had immunity from the fever of this epidemic: negroes, mulattoes, Hindoos, and Chinese, were alike attacked, whether of creole origin or immigrants. The Chinese suffered very severely; the negroes less so. The native Indians living in the woods are reported to have been proportionately the greatest sufferers.

The chief peculiarity observed in the cases affecting the black and coloured population was the severity and early occurrence of head symptoms, amounting frequently to delirium and violent excitement. The convalescence of the black and coloured sick was much more rapid than that of the white population. In the latter, head symptoms, when present, were developed as a rule only towards the last stage.

The following is a return of fever cases treated in the Colonial Hospital, Port of Spain, Trinidad, for part of the year 1869 :—

Months.	Diseases.											
	Remittent Fever.		Yellow Fever.		Typhoid Fever.		Ague.		Simple Continued Fever.		Total.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
January	8	1	..	..	..	..	18	2	..	..	26	3
February	1	..	1	1	..	..	17	2	..	..	19	3
March	1	..	..	..	..	..	10	..	..	..	11	..
April	1	..	..	..	1	1	9	..	..	..	11	1
May	2	..	..	..	2	1	21	2	2	..	27	3
June	1	..	..	..	..	..	11	..	1	..	13	..
July	20	1	11	4	..	..	6	..	..	..	37	5
August	12	1	8	4	..	..	40	3	..	..	60	8
September	12	..	9	..	..	..	22	..	..	..	42	..
October	3	..	5	2	..	..	17	..	..	..	25	2
Total	61	3	34	11	3	2	171	9	3	..	27	25

The following information is derived from the Registrar-General's Office, Port of Spain :—

RETURN of Deaths from Fever in Port of Spain, for the Year 1869.
Population, 20,000.

Months.	Remittent Fever.	Simple Continued Fever.	Typhoid Fever.	Typhus Fever.	Yellow Fever.	Ague.	Febricula.	Total.
January	3	1	..	..	..	1	..	5
February	1	4	6	..	1	..	..	12
March	3	3	10	..	1	1	..	18
April	1	..	7	..	1	..	..	9
May	1	1	3	..	1	2	..	8
June	2	..	10	1	7	..	..	20
July	6	..	21	..	17	..	..	44
August	4	..	10	..	16	2	1	33
September	3	..	2	..	8	1	..	14
October	5	..	3	..	6	2	..	16
November	7	..	1	..	2	2	..	12
December	..	..	..	..	..	..	..	..
Total	36	9	73	1	60	11	1	191

RETURN of Births and Deaths in Port of Spain. Estimated Population, 20,000.

1868.	Births.	Deaths.	1869.	Births.	Deaths.
For 1st quarter ..	143	197	For 1st quarter ..	183	226
,, 2nd ,, ..	143	178	,, 2nd ,, ..	178	249
,, 3rd ,, ..	162	235	,, 3rd ,, ..	189	371
,, 4th ,, ..	178	219	,, 4th ,, ..	146	203
Total	626	829	Total	696	1,049
Annual rate per 1,000 of population ..	31·3	41·4	Annual rate per 1,000 of population ..	34·8	52.4

The following is a brief description of the *post-mortem* appearances observed in the case of a mulatto who died in the Colonial Hospital in the act of ejecting black vomit, and who had presented very well-marked symptoms of yellow fever :—

Sectio cadaveris two hours after death.

General Condition.—Cadaveric rigidity well marked ; muscular condition good ; apparent age 20 years. A distinct yellow tinge was easily recognized from the natural colour of the skin.

Cellular tissue of an intensely yellow colour.

Abdomen.—Peritoneum very deeply jaundiced, but darker over that part covering the small intestines.

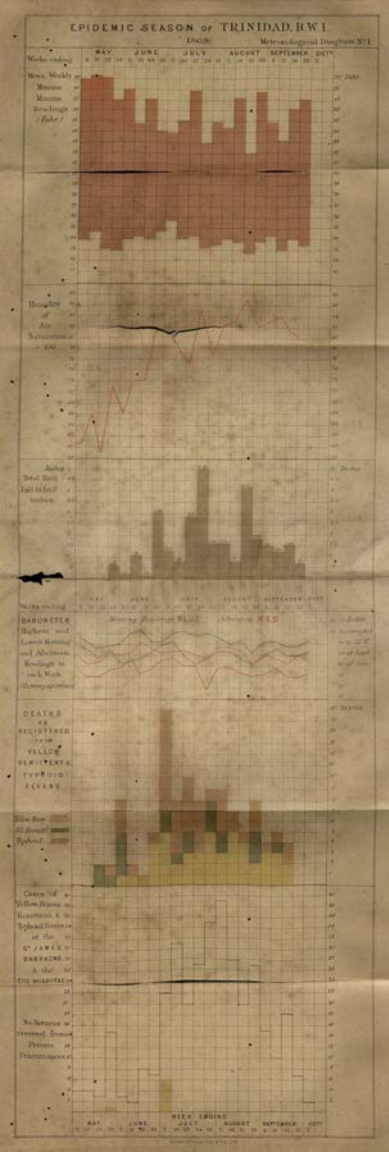
Stomach distended, rising two inches above lower border of liver ; on opening it, it was found to contain half a pint of dark inky-coloured fluid, of the consistence of pea soup. Mucous membrane detached in patches.

Gall-bladder empty ; its lining membrane covered with a thin layer of dark coagulated bile, closely adherent.

Bands of lymph connected peritoneum with surface of right lobe of liver apparently of old standing.

Liver not congested, of a pale saffron colour, normal in size.

Spleen hard, weight 6½ ounces, intensely congested.

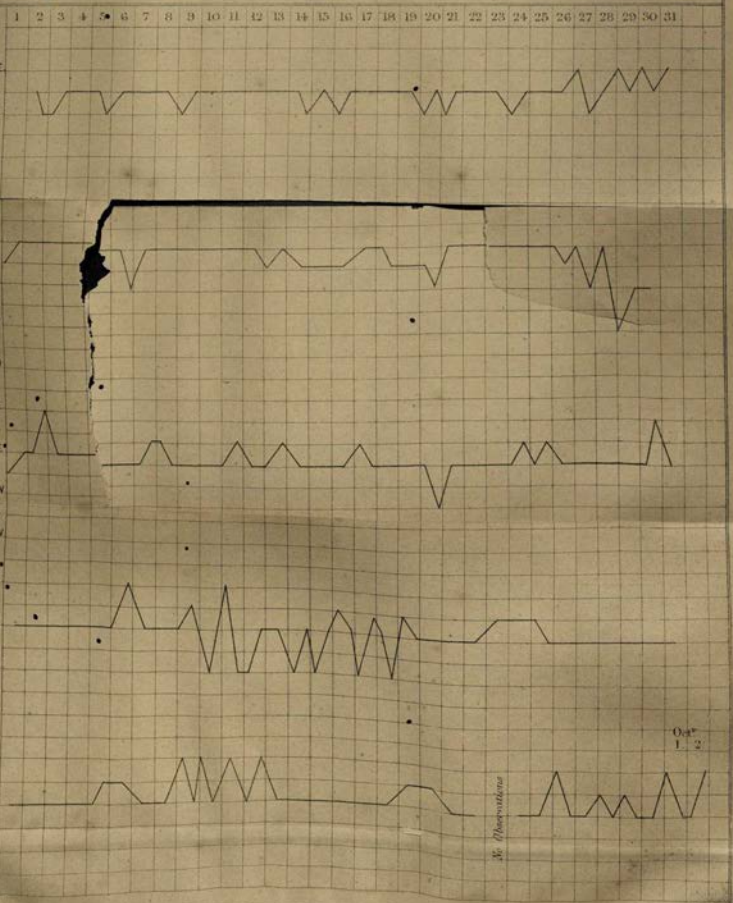

EPIDEMIC SEASON OF TRINIDAD, B.W.I.
Meteorological Diagram No. 1
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCT.
Weeks ending
Mean Weekly Minima Minima Readings (Fahr.)
Fahr.
Humidity of Air Saturation = 100
Inches
Total Rain Fall in half inches
Inches
Weeks ending
BAROMETER Highest and Lowest Morning and Afternoon Readings in each Week
Morning Reading in BLUE
Afternoon RED
DEATHS AS REGISTERED FROM YELLOW SEMITENTS TYPHOID FEVERS
Yellow Fever
Oil Remittent
Typhoid
Cases of Yellow Fever, Resistance, & Typhoid Fever at the St. James's Barracks, & the Cole Hospital
No Returns of Personal Sources Private Practitioners
WEEK ENDING

REPORT ON FEVER AT TRINIDAD.
1869.

Meteorological Diagram N°2.

DIRECTION OF THE WIND.

N.B. Two Observations every day are made, at 9.30 a.m. and 3.30 p.m. When only one point is marked for a day, it is to be understood that the morning and afternoon Observations shewed the wind to be in the same quarter. E.G. from the 10th to the 13th May, the wind was due East, the morning Observation is always marked as nearest to that of the previous day.



Kidneys.—Right one weighing 5¾ ounces, left one 6 ounces; both intensely congested; left one more congested than right.

Ureters of a pale yellow colour.

Bladder empty.

Lungs intensely congested, especially at their posterior parts, but cupitant throughout.

Heart natural; valves tinged with bile.

Brain.—Membranes yellow in colour; more apparent at external part of convolutions.

A specimen of the contents of the stomach, when placed under the microscope, showed a mass of broken-down blood-cells mixed with colouring matter.

The accompanying diagram, marked No. 1, exhibits the thermometrical and barometrical readings in weekly periods during the epidemic season, as well as the rainfall and humidity of atmosphere. The deaths from yellow fever, remittent and (so-called) typhoid fevers, as registered in Port of Spain and at the Colonial and Military Hospitals, are similarly shown for the same period.

Diagram No. 2 indicates the direction of the wind from May to September. For the use of both of these diagrams, I am indebted to the courtesy of Dr. R. H. Bakewell, the Officer of Public Health of this colony.

The writer is fully conscious of the imperfections and deficiencies of this Report, more particularly in the paucity of cases fully and scientifically reported, although for this he is scarcely responsible, as his duties do not permit of his living at the barracks, and the resident Medical Officer exerted himself to the utmost in the discharge of his duty, although twice the victim of severe attacks of fever.

APPENDIX, No. XI.

REMARKS ON THE CONTINUED ENTERIC FEVER OF BERMUDA.

By W. G. Don, M.D., Assistant-Surgeon, Royal Engineers.

When I arrived in Bermuda in June 1867, I was not aware of the fact that a form of fever bearing the general name of "typhoid" (both popularly and professionally) had for some seasons previously been prevalent both among the civil and military population of the island.

By many civilians this form of fever was considered new to Bermuda, having its rise only since the great yellow fever epidemic of 1864; others dated its appearance from the return of certain coloured labourers from St. Domingo some eight or ten years previous to that date; while a few seemed to regard it as really an old disease, although recently vastly more prevalent.

Whatever may be the fact as to origin and date of appearance, this at least is quite certain that the disease in question has appeared every summer since 1864 somewhat epidemically, attacking all classes, civil and military, old residents and new comers, white and coloured. During the hot seasons of 1867, 1868, and 1869, I have had ample opportunities of observing many cases of Bermudian fever, whether simple continued, or enteric (so-called typhoid), both in my own corps and also in those with which I have been quartered, as well as among civilians; I therefore venture to offer the following remarks with the view of elucidating, as far as my own light permits, what seems to me the nature and mutual bearings of these forms of fever, of which the very important enteric variety now seems endemical to the islands, and may be looked for yearly. Having no sufficiently exact data, I can give no statistical synopsis of the cases of fever which have come under my observation, but shall offer rather a few general remarks.

As in the tropics and subtropics all the world over, various forms of continued fever are met with at certain seasons of the year, so in Bermuda. During the hot season occur many cases of febricula and simple continued fever which vary very much both in intensity and duration of symptoms.

The "febricula" of Bermuda, which (as in the Southern States) goes by the name of "broken bone fever," from the common severity of the accompanying neuralgic symptoms, corresponds to the simple, short, ardent febrile attacks so common in India, and, as in that country, is most frequent among the unacclimated, and may in a general way be referred to the peculiar stimulating effects of great solar heat, especially in combination with alimentary indiscretions.

The "continued" forms of fever in Bermuda may appear as merely exaggerated and lengthened febricular attacks, or in other cases be prolonged for ten or fifteen days, and in a few may be still further prolonged and associated with low typhus-like conditions of the vital and intellectual functions. Malarial remittents and intermittents are apparently never met with as indigenous products of the Bermudas, and I am more and more inclined strongly to believe that true specific contagious yellow fever is also an exotic.

I mention these forms of fever in order that the enteric continued type may appear in due relation to them, and also to show that it is indeed a matter of no small difficulty to draw a sharp scientific line, either in practice or theory, between the different forms of continued febrile disease as seen in such a climate as Bermuda. Moreover, the various forms of con-

tinued fever are there seen occurring side by side and apparently originating under precisely similar circumstances, indeed sometimes running into each other, *e.g.*, after an attack of febricula convalescence is delayed, and low continued, or markedly enteric, fever is ultimately developed. The prognosis of cases at first apparently most simple becomes therefore often most difficult and should in all be very guarded.

At the same time I am not prepared to affirm positively that I consider the bowel lesion a mere superaddition, so to speak, to the ordinary continued cases, and therefore, as a pathological fact not of specific import, yet, on the other hand, to account for this Bermudian enteric form of fever by a theory implying and involving a special specific causation raises difficulties which I confess seem logically almost insuperable. Hereafter I will mention some facts as regards signs and symptoms which tend to show that the enteric fever of these islands is at all events not identical with the so-called specific self-propagating abdominal typhus of England and elsewhere.

Nomenclature, &c.—I am recording the experience of all when I state that, on a case presenting itself, it is often exceedingly difficult to pronounce with any degree of certainty on the exact type, whether in fact it may prove a simple continued case, or one which ultimately may be complicated with bowel lesion. Consequently, not a few cases originally admitted into hospital under simple continued fever have, as the disease advanced, shown much evidence of implication of Peyer's patches, yet have never appeared statistically under either the terms enteric or typhoid. Some little statistical discrepancies are thus accounted for in the comparative numbers under the different headings in different hospitals, while the substantial facts as to the nature of the cases probably were the same. In the scientific designation of a disease there is clearly much in a name, so I consider the term typhoid, as applied to the enteric fever of these islands, to be objectionable, as thereby identifying it fully with the typhoid of authors. The term enteric, however, of the new statistical nomenclature is every way preferable, as simply expressing a fact without perhaps committing to a theory. The fact being, as I apprehend, a continued fever, of which infiltration, inflammation, softening, and ulceration of certain intestinal glands forms a most grave complication. The theory may consist in considering these bowel lesions as necessarily of a specific nature, and the result of a logically demonstrable special *materies morbi*, thereby implying a causation differing from that of simple common continued tropical fever.

Further, the difficulty in drawing a sharp scientific line between a case of continued fever without, and one with bowel complication is better appreciated when, as I repeat, the line of demarcation between the two forms is often so ill defined as to afford no trustworthy diagnostic symptoms. While the general terrestrial and meteorological conditions in the tropics which, (operating especially on Europeans), giving rise to febrile phenomena are so ill understood, the greater difficulty in determining those still more obscure influences which produce types or specific febrile results is of course no marvel. It may logically be less satisfactory to ascribe the production of these fevers to general rather than to special or specific causation, yet thereby do many points, both in their pathology and etiology, become less wholly inexplicable. In the absence of more explicit facts than what as yet appear, I am, therefore, of opinion that both the simple continued and enteric forms of fever in Bermuda originate in the same, at present undefined, terrestrial and general climatic conditions—a theory which, perhaps, it is equally as difficult to prove as to disprove. On the other hand, if we seek for purely local, tangible, and popularly demonstrable causation, rigorous logic, in a series of mutually destructive inferences, reduces the evidence scientifically to nothing. Assuming, therefore, that these fevers are produced by the same general, rather than by distinctly specific conditions of soil and air, there seems more reason to regard them as diseases of nutrition rather than of a zymotic self-propagating character. Although the localization of a febrile disease, as in a camp, and its prevalence among a body of men living under the same conditions strongly points to some form of zymosis as an element in its spread, yet it should be remembered the apparently spontaneous origin of the first cases is not thereby elucidated.

Supposing the first step to be depraved blood change, certain vital and pathological changes of the nutritive functions rapidly follow, which, although in all cases necessarily similar, yet may neither be specific nor identical, but vary according to certain contingent circumstances, such as the constitutional peculiarities or diathesis of the individual affected. Bearing on this, I may state that in the worst enteric cases I have invariably observed the feeble vascular development and other external constitutional evidences of the strumous diathesis; on the other hand, the simple continued fevers, without bowel lesion, were generally in individuals of a more robust frame.

It, therefore, becomes practically of more importance to individualize the patient and the symptoms than to generalize the morbid phenomena. Such a view no doubt strikes at the root of certain specific and somewhat theoretical methods of treatment. Facts bearing on these general remarks will be gathered from the following short account of the continued enteric fever as it has shown itself every summer in Bermuda for some years past:—

Annual Period of Recurrence and Prevalence.—The climatic conditions coincident with the development of both simple continued and enteric fever in Bermuda are distinctly those connected with great solar heat and a high diurnal range of temperature. Cases generally begin to appear about the end of May and continue up to November or even December. From May to October is the hot season, in which months, although the temperature is comparatively never excessive, it often ranges up to 87° and 89° in the house, but the mean is remarkably high and sustained. There is no relief, even for a day, from the hot steaming atmosphere, and during the whole period the house temperature may never be under 76° and seldom under 80°. But even this high temperature would be bearable but for the humidity of the air and absence of skin evaporation when south-west or Gulf Stream winds blow—producing much prostration both physical and mental.

It must be noted that adynamic febrile disease is rarely seen, at all events among the military, during the winter months, from December till May, while the prevailing winds are northerly, even, although the mean temperature is then equal to that of an English summer, and the vegetation vigorous.

It seems thus that for the development of the cause or causes, which induce the febrile states under review, high solar elevation is required; although when once developed these causes do not die down while the temperature remains high, notwithstanding the sun's retrogression southward. Moreover, although dropping cases of the disease occur at irregular intervals, common observation notes the tendency in a given body of men for a batch of two or three cases to appear together, followed by, say a fortnight's interval of apparent immunity. Such might be explained either by a theory of an incubative period in each case, or on the supposition of a "pandemic wave" influence exerting its power at given intervals, say at bi-monthly lunar periods. But such is mere speculation, in the absence of instruments by which the fluctuations of the correlative meteorological forces could be duly noted and compared.

During the hot months, cases of the enteric fever have appeared pretty simultaneously all over the islands in isolated places, both among the civil and military population. It may safely be affirmed that the origin of such cases could not be consistently explained on a theory of specific or merely local causation. I have known cases in localities where it was impossible to lay the finger on sanitary defects other than those universally existing in places where no disease had appeared.

Various unhygienic conditions have, of course, with more or less show of probability been blamed in a manner indicating a lurking belief in a purely pythogenic origin rather than implying acquiescence in a specific causation. But in all such search for a causation the logic of facts seems to show that the exceptions to are quite as numerous as the pythogenic rule sought to be established. For instance, in accordance with the usually received opinions regarding the media through which enteric febrile diseases become self-propagating, tank-water has been at once suspected and blamed. Granting, however, that in some instances among the lower stratum of the civil popula-

tion suspicion of fæcal water contamination has amounted almost to certainty, the theory by itself completely breaks down if carried to Prospect Camp, where the said form of fever has been rather prevalent than otherwise. There the rainfall is immediately conducted in closed pipes from the roofs of the huts into large iron and stone cisterns, sewage contamination of which is impossible. So again, I am not aware that the poorer civilians, drinking very doubtful and indifferent water from wells, have suffered more from enteric fever than their richer neighbours who draw their supplies from properly constructed tanks. Again, the cess-pit system, with attendant soakage of sewage matters into the porous rock formation, has been loudly blamed and, as a system, most justly condemned. But however filthy, unsanitary, and wasteful such a method of disposing of latrine matter is, when the "dry earth" system could be so effectually and economically carried out, yet, as a source of enteric fever the same objections on broad rules as to the tank-water theory crop up in every direction.

In the filthy purlieus of St. George's any amount of tank and soil contamination is probably possible and conceivable, but the appearance of marked enteric disease in the newly-formed camp at Port Royal in 1868, pitched on fresh soil and far removed from town infection, as well as in other equally isolated localities, could hardly, as in St. George's, be explained by any purely *fæcal theory*.

Further, it must be borne in mind that both tank and soil pollution continues the same during the cool but mild winter as in the summer months; but the fever is nevertheless probably wholly in abeyance; fæcal contamination also is now no worse, but probably greatly less in and about habitations than in former times when the enteric form of fever (according to intelligent Bermudians) was practically unknown.

These reflections suggest a change of type in the fevers of the islands within a recent period, and indeed this is nearly certain, for some little change of type is even observable from year to year, and is not unlikely to have been more marked since 1864. Great and malignant epidemics, such as the yellow fever of that year, do, as is well known, often impress a low adynamic type on the febrile affections which follow in a community for some time afterwards.

While offering these remarks, which are as much of a negative as of a positive character in estimating the causes of the fever, I am at the same time very far from wishing to ignore or undervalue several general unhygienic conditions which, without doubt, predispose large sections of the population to such diseases. Such conditions relate not only to soil and water contamination, but to defective house accommodation.

The peculiarities of the rock formation and the absence of any considerable surface elevation does not admit of fresh-water springs, properly so called, so that the water supply is wholly derived from tanks filled from rain catches, or from brackish wells replenished by mere soakage from the surface. As numbers of the poorer houses have no private cisterns, and there being no public tanks, many of the lower classes habitually drink water of very indifferent quality, and frequently in the summer months suffer a good deal from absolute scarcity. So, again, the filthy cess-pit latrines are often for the sake of mere convenience, placed close to dwelling-houses, sometimes even built in recesses after the fashion of water-closets. Lastly, there is no scientific attempt whatever at house ventilation, even in the best Bermudian dwellings. In a climate which does not necessitate fire-places in sitting rooms, and where, consequently, there is no chimney air-shaft, ventilation can be effected only by doors and windows, but when these are closed, as they much too often are, both sitting-rooms and bed-chambers become at once so many shut boxes. Overcrowding is, moreover, a frequent evil, especially among the coloured population.

Now, anyone might justly say that here are insanitary evils great enough to account for any form of low fever among the civil population. But let such be granted, we must seek then for a different causation among the military, who are not directly exposed to such evils. Nor can the argument be fairly employed that the soldiers suffer because the civilians breed such diseases, for there is no reasonable proof of any such spread; and so, whether the causation of the enteric fever of these islands be considered as necessarily

specific, or whether viewed as springing from a broader undefined pythogenic source, all attempts at localizing it are beset with difficulties.

General Symptoms and Progress.—One of the very first points to be noted in the continued enteric fever is its exceedingly insidious and often very gradual approach. In some instances the patient will be compelled to lay up from the very first appearance of the general pyrexial symptoms, but in many more instances the affected individual may ail for a week or a fortnight before he seeks medical assistance, his general complaint being a little headache and giddiness, anorexia, progressive debility, and indescribable langour both of mind and body. Failure of both gastric and intestinal digestion seems to precede shortly the general pyrexial phenomena. Where such vague symptoms exist there is danger of their not attracting the attention they really demand, coincident as they probably are with the commencement of important pathological changes in the intestinal glands. A patient having fairly come under medical observation, in addition to the above symptoms, there will often be found muscular pains in back, neck, and legs; the tongue pale or slightly furred, darker towards the root; the pulse may not be over 80°, or indeed materially increased in frequency, but is invariably very weak; a slow pulse throughout characterizes some cases, but when serious or fatal symptoms supervene it invariably mounts up; the skin temperature is increased with however but little of that pungency to the touch so marked in short sharp attacks of febricula or simple continued fever; profuse and apparently causeless perspirations are common; the patient may finally have a little cough and feel, in short, as if he had an attack of influenza. Now, all these symptoms may be present in simple low continued fever without looseness, pain in bowels, or any other direct sign of intestinal complication; but if they co-exist with diarrhœa and abdominal pain, there can be no doubt but that bowel lesion is in progress. So, therefore, inquiry into the state of the bowels becomes of primary importance. On this head, a soldier patient may simply report that his bowels are loose, which is very ominous; or he may say vaguely that they are "free," from which on cross-examination is elicited that for some short time back there had been a tendency to probably painless diarrhœa with brief intervals of apparent constipation. Abdominal pain is not at all an invariable complaint, especially at the early stage of the fever, and may never be troublesome even throughout.

A case presenting itself in Bermuda during the hot season having all or the leading symptoms here sketched, must be carefully watched and nursed as it will, in all probability, end in a serious attack of enteric fever. It is, of course, very important to get a patient directly under treatment as near the actual commencement of the disease as possible, but this is very often not practicable. I think I have been able to watch some cases probably from the very beginning, the following example whereof is instructive:—

Sapper J. R., aged 26, service in Bermuda 1 year 4 months, a blacksmith, of large frame, but singularly lax strumous fibre; suffered from pleuropneumonitis in 1868, and general health indifferent since arrival in command. Admitted into hospital on 2nd August, 1869, complaining of neuralgic pains in neck, left shoulder, and back of scalp, which he attributed to sun exposure while driving a cart on the public works. According to his own account he had a slight febrile attack for one day shortly before admission, but at that time had no pyrexial symptoms. There were, however, the important indications of foul tongue, loss of appetite and digestive power, and irregularity of the bowels. The neuralgic pains speedily disappeared under appropriate treatment, and the patient had so little specific complaint that he begged to be allowed to try his duty in the hope of thereby shaking off his ailments; to that I did not accede, as I was but too well aware of the man's weakly constitution, and attached much importance to his generally unhealthy look, taken into consideration with the suspiciously abnormal state of the digestive tract. On the 15th, or 12 days after admission, he complained of a little headache with mild febrile symptoms, and the bowels, which had hitherto been alternately relaxed and constipated, now became steadily loose two or three times daily, yet with very little abdominal pain. Pulse was now as hitherto from 75 to 85, weak and without healthy tone. On the 17th looseness of the bowels was still more marked, febrile symptoms more pro-

nounced, and state generally worse. By the 19th the true nature of the attack was unmistakeably clear, and was classed under enteric fever. On the 21st all the symptoms were suddenly greatly aggravated—bowels very loose, stools, as throughout, dark green, liquid, and offensive; pulse suddenly bounding up to 110, with corresponding increase in skin temperature; much headache, and restless delirium. Treatment was of no avail; he sank into stupor, and died on the 23rd.

Post-mortem examination showed the immediate cause of death to have been acute cerebral congestion, with much serous effusion into brain. Several of Peyer's patches were ulcerated, but more were simply red and tumid; there was no gastric, hepatic, or splenic complication.

The early stages of the fever were in this case, I believe, well exemplified. It may reasonably be inferred that from the period of admission (or the primary transient febrile attack which occurred just before) until the pyrexial symptoms and bowel complication became finally well developed, pathological changes were all the while progressing in Peyer's patches. Again, but for the neuralgia, I should not probably have seen the patient at all during this early stage of the disease, and he would probably have remained outside struggling to do his duty while already actually in the clutches of a very serious malady. It was also clear that intestinal ulceration had not had time to progress as far as is usually seen in fatal cases of the fever, on account of the supervention of the fatal cerebral complication.

From the insidious history of this case, as well as from others, I feel satisfied that there usually is a considerable period of vague ill-health preceding an attack of this fever, which, if not actually a part of the disease, at all events is a necessary prelude to it.

Corporal J. W. told me he felt unwell for nearly a month before he was obliged to come to hospital. His case occurred in October 1861, and was very severe and protracted.

Corporal D. McG. suffered during the spring months of 1869 from tonsillitis, influenza, and indeed general ill-health. Immediately on the commencement of the hot weather he fell ill of enteric fever.

Corporal H. W. had a short continued febrile attack in the end of August 1868, but did not mend on the disappearance of the pyrexial symptoms; about the middle of September there was a relapse of fever, with marked enteric complication, which ran a course of nearly a month.

On the other hand, some cases seem to start from a preliminary illness of only a few days.

Sapper A. C. suffered from giddiness and febrile symptoms, with slight cough, for four days in September 1868 before he applied for admission into hospital. Active enteric symptoms were not developed until nearly a week after admission, but within 17 days from the first febrile attack the case terminated fatally.

Corporal J. M. had an ardent febrile attack in October 1869, which speedily drifted into enteric fever; but the termination was favourable within a month.

From such cases I infer that any illness which, in young and especially strumous subjects, lowers the general health in Bermuda during the hot season will directly predispose to this form of fever.

In endeavouring as much as possible to individualize the subjects of this fever I have been much struck with one fact which fully coincides with the experience of others, and it is this—that the notorious hard drinkers are rarely attacked. Certainly, not one of the drunkards among the Sappers have suffered, and the worst cases have been in quiet temperate non-commissioned officers. It would be treading on dangerous and delicate ground to hint or affirm that the use of alcohol is prophylactic in this disease, but the explanation of the fact (which cannot be blinked) probably lies somewhat deeper: it is pretty certain that hard-drinking soldiers are generally—to begin with—men of iron constitution, and therefore less predisposed to adymanic diseases; strumous weakly men, on the other hand, with constitutional proclivity to diseases of low nutrition, rarely drink hard, at least such is my experience, being restrained probably more by mere physical inability to withstand indulgence than by loftier moral principles.

As regards age the worst cases I have seen, whether of the simple or enteric fever in Bermuda, have been in men between 25 and 30. The usual apparent length of the attacks is from two to four weeks, within which time a favourable or unfavourable termination will be fairly decided.

The following may be given as the general symptoms of the disease in a case fairly developed:—

The tongue becomes thickly coated, or brown and dry, with red edges. Congestion of the skin of the face and neck I have observed in all cases having pneumonic complication, pointing as it does, to feeble capillary circulation and defective blood aeration; when it is present basal pulmonic congestion may be confidently inferred. The surface temperature is usually neither great nor pungent, that in the axilla being usually from 98° to 102° Fahr.

Profuse and apparently causeless perspiration is common, accompanied sometimes with a little febrile exacerbation towards evening, indicating a faint approach to a remittent type. The pulse throughout is very feeble, seldom over 95, and often remarkably slow, especially towards the end of a case. Evolution of animal heat is then also very feeble, and the free use of hydro-carbons can be well borne. The mental faculties are generally pretty clear—only in the worst cases is there much delirium. Indeed, I have often thought there was some undefined relation between the state of the bowels and the intellectual faculties in fevers which might be thus expressed: in the febrile state, with diarrhœa and free intestinal secretion, the mind is usually clear and nervous sensibility tolerably acute, but in the typhus-like fevers, with constipated bowels, there is dull stupor and much mental hebetude.

The amount of the intestinal mischief seems to bear a clear relation to the amount of abdominal pain and the urgency of the diarrhœa. The evacuations number from two to ten in the 24 hours. I wish to state most particularly that in not one of my own cases have I observed the stools "yellow," "ochry," or like "pea soup"; but, although this is the general, it has not been the invariable experience of others. The stools I have seen have, without exception, been either dark green or brown in colour, liquid, frothy, and offensive. The question naturally suggests itself, is this a diagnostic sign of any importance? It is so, of course, if the specific typhoid fever of authors is diagnostically characterized by light-coloured yellow stools; for then assuredly the enteric fever of Bermuda differs from it in at least one important particular.

Again, I would pointedly note that I have never seen any uniform rash or spots. Sudamnia are common, and if the weather is very hot, persistent prickly heat often abundant; but any evanescent eruption I have not been able to detect. Here, again, another diagnostic mark of so-called specific typhoid is wanting.

The urine is generally scanty and febrile, but I have not detected albumen when it was looked for. The chief complications of the enteric, as well as the simple continued fever in Bermuda are pulmonic. Bronchial irritation and basal lung congestion is very prevalent.

Epistaxis I have observed in only two cases.

Hæmorrhage from the bowels, as a result of intestinal ulceration, has occasionally occurred, sometimes in fatal cases, and sometimes in apparently very slight cases. Perforation of the bowel, with collapse and death, I believe to have occurred in one of my own cases during the period of convalescence, but there was no autopsy to verify the diagnosis. The patient was a boy, aged 13 (son of a serjeant R.E.), who had a short attack of the fever in October and November 1868, but was convalescent in the third week, and able to sit up. All was apparently going on favourably when he was suddenly seized with violent abdominal pain, strong fever, a very rapid small pulse, but no hæmorrhage per anum; tympanitis, delirium hiccup, and death occurred within 30 hours.

Sapper A. C., on the 15th day of fever with marked enteric symptoms, was seized suddenly with nausea, abdominal pain, and increased looseness of bowels; the skin became burning hot, and the pulse bounded up from 90 to 110; excessive tympanitis, delirium, collapse, and death ensued within 30

hours. Perforation, with peritoneal effusion, was confidently expected at the *post-mortem* examination, but not found. There was no complete rupture of the bowel, although at many places the ulcers were merely covered with the thinnest film of peritoneum. The excessive tympanitis resulted from a curious invagination of the mucous membrane of the transverse colon, which, although easily reducible and not preventing the passage of fæcal matter shortly before death, completely prevented the downward escape of flatus, with which the whole bowel was enormously distended. In the duodenum and jejunum there was a quantity of thick black matter like blood or biliary secretion acted on by iron, but which could not be accounted for by anything the patient might have swallowed before death. The mucous membrane of the pylorus and duodenum showed a number of red points, and seemed to permit capillary oozing of blood—the probable source of the black matter alluded to. The question at once suggested itself, was there here any suspicious evidence of a tendency in the fever to assume a hæmagastric and hæmorrhagic type? The death occurred on the 16th October, 1868.

Treatment, &c.—The treatment adopted in these fevers has of course varied greatly. I am not aware that any specific method has met with more success than that which proceeds simply on general therapeutic principles guided by the phenomena presented in individual cases.

The insidious and slow approaching form of fever neither indicates nor warrants measures with the view of aborting the attack. But, on the other hand, sudden ardent febricular attacks are appropriately met and apparently shortened with speedy relief of all the symptoms, in the majority of cases, by an emetic of zinci. sulph., a hot bath and swathing in blankets. Indeed, in all cases complicated with neuralgic muscular pains in any of the Bermudian types of fever, the warm bath, followed by wrapping in blankets, will be found to minister much to the relief of these otherwise often so distressing symptoms.

The maintenance of diaphoresis is, of course, very important; where headache, pretty ardent febrile symptoms, and probable tendency to pulmonary congestion exists, in conjunction with diaphoretics, antimon. tart. in a sixth or eighth of a grain generally acts very favourably by lessening cardiac and vascular excitement. As a rule, the subacute adynamic febrile symptoms which usher in the purely enteric form of fever neither demand nor permit heroic measures. As regards the diarrhœa any attempt to control it, whether by mineral or vegetable astringents, is attended by no apparent good effect, and is very probably injurious at all the earlier stages of the disease. At the same time, the urgency of this symptom often compels attention, especially at night; the administration at bedtime of a little Dover's powder or of tinct. camph. c. opio, with chloric ether and aromatics, will often temporarily relieve the looseness, and thus conduce to sleep.

The administration of dilute mineral acids in free doses from an early stage of the disease seems attended with very good results. Large doses, from half a dram to two drams freely diluted of acid. nitro-hydrochloric. dilut. appears to have a general tonic action on the digestive mucous membrane, besides very probably a somewhat antiseptic effect on the blood, thereby tending to maintain the functions of such organs as the spleen, which, in the majority of cases, seems less or more affected.

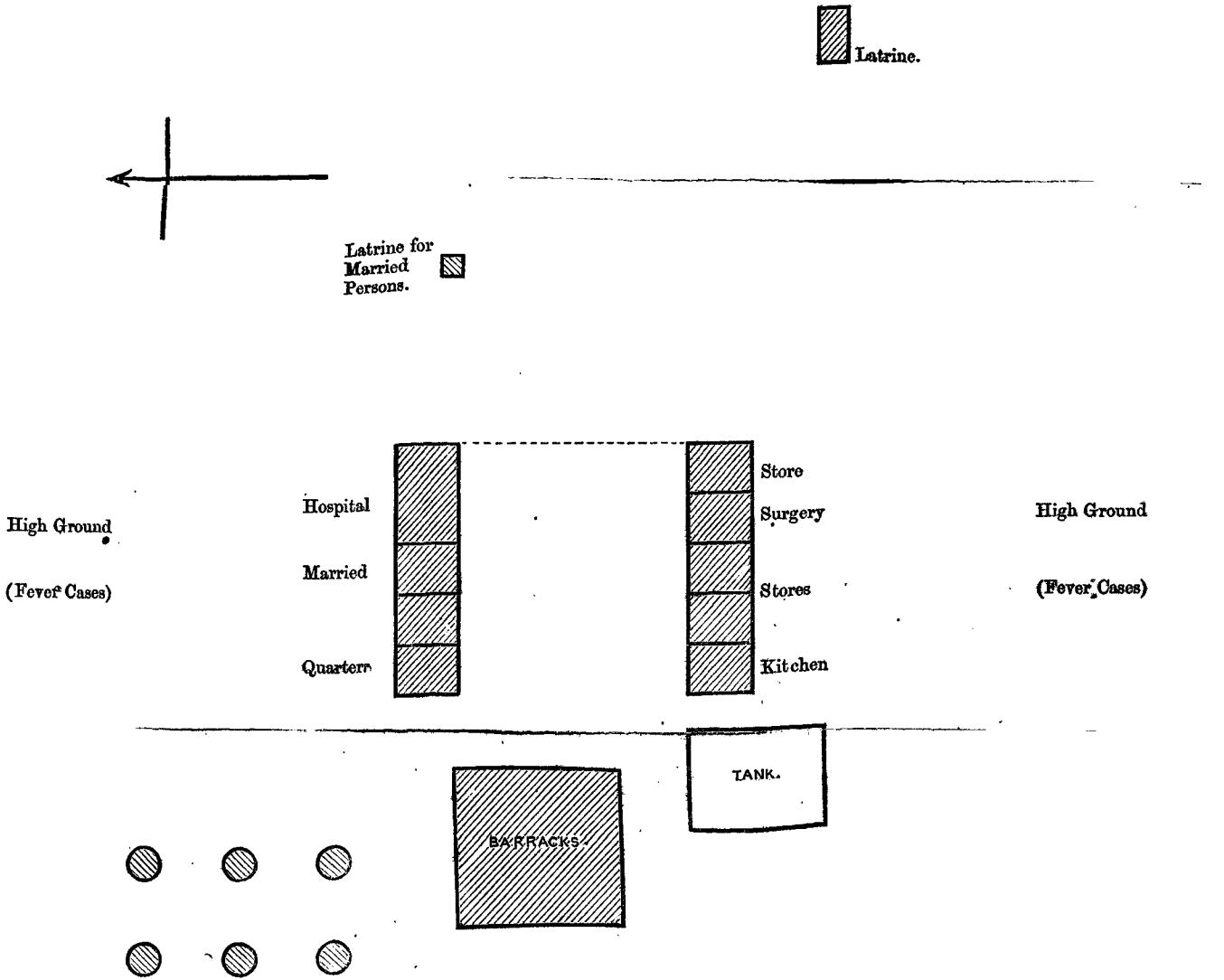
Transient (although often troublesome) delirium can generally be controlled by small blisters behind the ears. In only two enteric cases have I had a fair opportunity of trying the treatment by creosote. The form given was the mist. creosoti, and the dose about a minim of the active drug several times a-day. The remedy in both cases seemed to lessen the febrile and vascular excitement—in one case the pulse became much depressed, but I am not prepared to state either that the attacks were materially controlled or shortened by the treatment. Both were very marked cases, and both recovered.

Careful nursing and dieting are of most prime importance in all the enteric cases. I have already stated that failure both of gastric and intestinal digestion seem to precede these attacks—most undoubtedly it follows them. The problem throughout is to give the patient the greatest amount of sustaining albuminoid food without in any way taxing the feeble digestive and assimilative powers. Especially is this difficult during the period of conva-

lescence; if bulky or too solid food is given before the patient has sufficiently recovered, aggravation of all the symptoms and even febrile relapse is apt to occur.

The indications for the administration of alcoholic stimulants, of course vary, but as a general rule, a very considerable amount is required, and can be borne. Brandy ought always to be handy for the nurse or orderly, as alarming failure of vital power often suddenly occurs, especially when the patient is getting out of bed on a movement of the bowels, and it is necessary to give stimulants on the spot without delay.

The stage of convalescence in all the fevers of Bermuda, but particularly in the enteric variety, is very protracted. So much is this the case, that soldiers who may suffer from an attack at the commencement of the summer will, in all probability, do little duty until the cool weather sets in. Indeed, from May until October recuperative power from all acute diseases is exceedingly small in that climate. In view of this fact, it seems worth while discussing the advisability of sending men who have suffered from fever early in the season to Halifax, Nova Scotia, for the recovery of their health. In the case of a non-commissioned officer of the Royal Engineers this was actually done last season on such recommendation. By the steady adoption of such a system the ultimate gain to life and health and efficiency would probably in the end more than balance the expense of passages to and fro.


Latrine.
Latrine for Married Persons.
High Ground
(Fever Cases)
Hospital
Married
Quarters
Store
Surgery
Stores
Kitchen
High Ground
(Fever Cases)
TANK.
BARRACKS.

APPENDIX No. XII.

REPORT ON MANDEVILLE, JAMAICA, IN RELATION TO THE OUTBREAK OF YELLOW FEVER AT THAT STATION, FORWARDED TO THE GENERAL OFFICER COMMANDING.

Kingston, Jamaica,
13th November, 1869.

Sir,

In compliance with para. 4 of General Orders No. 1547, 6th November, 1869, directing us to proceed to Mandeville for the purposes of inspecting and reporting upon the sanitary state of the cantonment at that station, and to make such recommendations as we may consider necessary, we have the honour to report that we visited Mandeville on the 11th instant.

The barrack buildings at Mandeville are hired by the Colonial Government; they are situated on the east side of the square or common of Mandeville, round which are congregated the Court-House, Penitentiary, and principal stores of the place. They consist of three buildings forming three sides of a square; on the west is a two-storied house; the barrack on the north, a one-storied building, comprising three married soldiers' rooms and the hospital; on the south a similar building, in which are various stores, kitchen, &c.

Between the kitchen and the barrack is the water-tank.

The premises are placed on a lower level than that of the other buildings forming the Mandeville square; the drainage is towards the east, but there is no natural outfall in that direction, this water being absorbed in a lower lying basin a short distance away, and the buildings are closely surrounded by higher land on the north-east and south.

Forty-three yards to the east of the barrack enclosure are the latrines these have been worked on an imperfect earth system; the soil deposited in tubs, with a little earth intermixed, has been periodically removed to a piece of ground adjacent to the latrine, orders being that it should be buried 3 feet deep and covered over with earth; but we have serious doubts whether the soil, as a rule, was buried to that depth. For four years past the soil of about 100 persons has been accumulating on a space of about 30 yards square, and the easterly or prevalent winds blew over it, and then passed through the barrack premises.

The effluvium from this source was described to us as having been very had, and at night (and especially after the late rains) most offensive.*

At the north-west angle of the barracks 16 tents were pitched in the small space of 38 by 30 yards; they were occupied by three men each. The circular trenches round the tents had not sufficient drainage from them, and this site after wet weather must have been very damp.

It was in some of these tents, and in the north range of huts, the end room of which was the hospital, that all the fever cases occurred. A patient

* *Vide* Army Medical Departmental Report for 1868, page 86, where Deputy Inspector-General O'Flaherty called attention to the urgent necessity for improving the conservancy of Mandeville, and stated that if it is to be permanently occupied by troops, many requirements will be necessary, to complete which a large expenditure would have to be incurred.

in hospital, whilst convalescent from another disease, was attacked with yellow fever and died. There were no cases admitted from the barrack.

On the elevated ground north and south of the barrack there were three cases of fever, two of which were fatal, and in the town also there were several deaths.

The troops were supplied with water during the dry season by water brought from tanks at a distance, and stored in the barrack tank; this latter has lately been enlarged, and will hold 48,000 gallons, and is connected with the roof of the barrack.

We consider that the mortality amongst the troops at Mandeville was occasioned by the malarious atmosphere brought by the prevailing winds from the space on which the latrine soil of the barracks had for four years accumulated, but we are far from thinking this the only source of disease in a place hitherto so peculiarly healthy as Mandeville.

We found on examination two other sources from which disease would most likely arise. These were the defective disposal of the contents of the Penitentiary latrines, the whole of which flushed out with water, are allowed to run in open gutters down the side of a hill near the eastern road of approach to the village, and then disperses itself on the land below. The other is an open water tank on the leeward into which pass the refuse and drainage of the market. When we inspected the water it had anything but a wholesome appearance, and the absence of roofing, leaving it exposed to the daily influence of a tropical sun, must have a very injurious effect.

We may add that the latrines of all the houses have cesspits, which are emptied only at long intervals.

To prevent, therefore, as far as possible, the recurrence of such an epidemic as has lately visited Mandeville, we recommend:—

1st. That the burying of the barrack latrine soil on the space hitherto set apart for that purpose cease at once.

2nd. That that space be covered over with about 3 feet of fresh earth brought from elsewhere.

3rd. That the Penitentiary latrine soil be properly disposed of.

4th. That drainage from the market be no longer permitted into the public tank, and that it be roofed over.

From what has been previously stated in this Report it is evident that the site on which the barracks stand is most unsuitable in a sanitary point of view. We therefore strongly urge the selection of a fresh site for barracks which shall be free from the sanitary disadvantages of the present one,—a site which the Principal Medical Officer considers should not again be occupied by white troops.

Should this recommendation be acted upon, some time must elapse before new barracks can be erected; it is therefore necessary to consider what steps shall be taken for the accommodation of the detachment at present at Mandeville.

We consider that the barrack might be occupied by 38 men were the partitions in the north lower room removed, and this we recommend, provided that the soil is in future removed to a distance from, and to leeward of, the barrack, and that the 3 feet covering of earth formerly specified be attended to.

The interior of the barracks should be well scrubbed with soap and water, and lime-whited.

The room occupied as a hospital is not fit for that purpose; it is connected with the three married quarters, and the floor on the north side is below the surface of the ground. We recommend some other place as a hospital, and that the room be used as a barrack-room, but only after cleansing with soap and water and lime-washing, and this should also be done to the married quarters; and after proper drainage has been carried out on the north side, and the external ground brought down to a lower level than the floors of the huts, four or five tents might be pitched on the north-west portion of the enclosure, but the surface of the ground should be previously arranged for the proper discharge of water, and the flooring should be kept well above ground.

The barrack tank should have a pump fixed in it to prevent the dipping for water, and a trellis to enclose the west side.

The north side of the range of stores requires also improved drainage.

A sketch of the barrack premises alluded to in this Report is attached.

We have, &c.,

A. H. FREELING, *Colonel,*
Commanding Royal Engineer.

J. FRASER, *Deputy Inspector-General,*
Principal Medical Officer.

The Major-General Commanding, Jamaica.

Copy of conjoint Report forwarded
to Major-General O'Connor, C.B.,
Commanding, Jamaica.

J. FRASER,
Deputy Inspector-General of Hospitals.

APPENDIX, No. XIII.

REPORT ON AN EPIDEMIC OF CHOLERA AT THAYETMYO, BRITISH BURMAH, IN 1869, ESPECIALLY WITH REFERENCE TO ITS APPEARANCE IN THE HEAD-QUARTERS AND RIGHT WING OF HER MAJESTY'S 76TH REGIMENT.

By Surgeon W. A. THOMSON, M.B., 76th Regiment.

Arrival of wing 76th Regt. at Thayetmyo.

THE Head-Quarters and Right Wing of Her Majesty's 76th Regiment arrived at Thayetmyo from Bellary on the 9th February, 1868. From that date till April 1869, no choleraic disease, so far as I can ascertain, appears to have occurred, either among the European or Native inhabitants of the station.

First report of cholera in the neighbourhood.

On the morning of 25th April, 1869, a case of cholera was reported in the Coolie lines situated to the north, and just immediately outside cantonment limits. The occupants of the Coolie lines or Coolie village are chiefly Coolies employed in the Public Works Department, regimental followers, such as Bheesties, Toties, and Sweepers, and a few Burmans. I immediately visited the spot to ascertain the truth of the rumour, and after a careful inspection, forwarded a letter to the Brigade authorities, of which the following is an extract:—

"The disease appears to have broken out about twelve or fifteen days ago, "and to have gone on steadily up to this date. The total number of deaths, so "far as we can ascertain, from the commencement of the disease up to this "morning, has been 12. Of this number four deaths have taken place in "the last 24 hours. A Toty attached to the 76th Regiment was the last "victim: he died at 6 A.M. this day. There are at present two fresh cases "(Burmese women) both of which will probably succumb.

Filthy state of Coolie lines.

"I have now the honour most urgently to bring to notice the filthy con- "dition of the Coolie lines. Situated just beyond cantonment limits, "though in reality under civil control, yet they seem to be looked after by no "one, consequently their insanitary condition can be more readily imagined "than described. They contain, in fact, all the best elements for fostering "epidemic disease, and I have no hesitation in stating, that if very strong "sanitary measures are not immediately undertaken and rigorously carried "out, the lines of the Garrison will be imperilled. A great portion of this "village is occupied by regimental followers, who, by residing there, remove "themselves from all control and supervision, in fact, put themselves out of the "way of that ready medical treatment to which they are entitled when sick. "I would strongly urge on the consideration of the civil authorities the neces- "sity of removing the village entirely, and compelling the residents to remove "to the Sudder Bazaar, where sanitary rules could be properly enforced.

"In conclusion, as a precautionary measure, I have the honour to recom- "mend that all soldiers of the Royal Artillery and 76th Regiment, as well as "Native Infantry, should be prevented entering the Coolie lines, by placing "a cordon of police sentries round them: this would be more effectual than "merely issuing orders on the subject, which are difficult to be enforced, and "apt to cause alarm."

Action of Civil authorities.

The Assistant Commissioner of Thayetmyo at once took active steps to have the Coolie lines cleansed, placed police sentries near, to prevent soldiers from having access to the place, and gave orders to the head man of the village to report daily the state of health of the inhabitants to the Civil Surgeon, and, immediately, the occurrence of a fresh case of cholera. The Assistant Commissioner communicated with the Deputy Commissioner of the District on the subject, and especially with a view to getting sanction for the entire

removal of the Coolie lines. The Deputy Commissioner in reply called for the opinion of the Military and Medical authorities at Thayetmyo, as to the advisability of such a step.

The matter was accordingly laid before the President and Members of the Cantonment Committee, who were unanimously of opinion that the village should be removed, both on military and sanitary grounds. This decision was accordingly conveyed to the Deputy Commissioner. What the ultimate issue may be, I am as yet unable to state. No decisive steps can be taken in the matter without the sanction of the Local Government. Opinion of Cantonment Committee.

Up to the 26th April, so far as could be ascertained, some twelve cases had occurred in the Coolie village, of which number eight died. From that date the disease seems to have left the village. On the 5th May, however, a Dhooly bearer employed in the Commissariat Godowns in the Fort, and residing in the "Shye Bustie," a village on the bank of the Irrawaddy, to the east of the Coolie village in a direct line, and distant from it about 400 yards, more or less, was suddenly seized with malignant cholera—rice water dejecta, cramps, collapse, &c., being well marked. He recovered from the primary symptoms, and was apparently doing well, when secondary fever set in, and carried him off on the 14th May, nine days after seizure. On the 7th May, a Store Lascar, living in the Store Lascars lines, close to the Battery Horsekeepers' lines, was attacked, and died on the 8th May. These two cases were treated in tents, pitched on an open, elevated, and airy spot, to the north of the Fort. The position was good, sufficiently isolated, and to leeward of the station. They were treated by a Native dresser, under the supervision of the Civil Surgeon. Progress of cholera. Cholera leaves Coolie lines. It appears in "Shye Bustie." Cholera in Lascars' lines.

It is difficult to ascertain accurately the date on which the first case occurred in the Coolie village, but I think it must have been about the 10th or 11th April: the last case, as I said before, occurred on the 26th April.

Recapitulation.

	Cases.	Deaths.
Supposed total cases in Coolie village from 11th to 26th April	12	8
Actual total cases in Shye Bustie from 5th to 14th May..	1	1
Actual total cases in Lascars' lines from 7th to 8th May	1	1

Since the 8th May only one case has occurred amongst the Natives in cantonments, which will be referred to hereafter. On the afternoon of the 9th May, Mrs. Sullivan, wife of Private Sullivan, 76th Regiment, was brought to Hospital at 2·30 P.M. in collapse, with rice water dejections and severe cramps. She died at 4·10 A.M. the following morning, 10th May. Mrs. Sullivan resided in No. 10 Married Barrack at the eastern end of the 76th lines. The building like all the European Infantry Barrracks at this station, is well built of wood, and raised 10 feet 6 inches from the ground. It has a wide verandah back and front. It contains 15 quarters, each quarter consisting of two rooms. They are well ventilated. Outbreak of cholera in 76th Regt. Description of married barracks.

The sanitary condition of the building and outhouses at the time of the outbreak was good. The total number of persons living in the building at that period, including men, women, and children, was 35. There was no overcrowding. Sanitary condition.

Mrs. Sullivan's case was rapid and most malignant. Her husband states that about 9 A.M. of the day she was attacked, she complained of looseness, and went several times to the privy, but did not think much about it, or seek medical relief. About ½ past 1 P.M. she felt weak, and lay down and slept about half an hour, when she suddenly awoke and called him to rub her legs which were painfully cramped. He did so, and then asked her to get up and walk about, thinking it might do her good, and not knowing what was the matter with her. She got up and tried to walk, but immediately fell over in a sort of fit most likely fainted). He then got her conveyed to Hospital. Nature of Mrs. Sullivan's case. Premonitory diarrhœa. Cramps set in.

It is strange that he should never have imagined when he saw his wife suffering so acutely from diarrhœa in the morning, that it would be advisable to get some medicine for her.

Collapse. When seen by me at 3 P.M. she was in collapse, her features sunken and quite altered, in fact she had all the characters of well-marked malignant cholera, developed to a degree that I have seldom seen equalled.

Death of Mrs. Sullivan. As stated above, she died at 4·10 A.M. of the 10th May, comatose, thirteen hours after admission. On the afternoon of the 9th May I had Private Sullivan's quarters evacuated, cleansed, and fumigated, and all soiled linen, bedding, &c., disinfected, and when necessary burned.

Precautionary measures. Cholera medicines (astringent pills and stimulant mixture) were the same night distributed to each barrack, and placed in charge of a responsible non-commissioned officer, with plain directions.

On the following morning, 10th May, the number of patients in hospital was reduced to a minimum by discharging every case which could possibly be treated outside.

Arrangements were made for the reception of fresh cases in the old hospital buildings, at the time unoccupied. At 4 P.M. on the 10th May, Private Hinton

Progress of the disease. came to hospital from the same building as Mrs. Sullivan (No. 10 Family Barrack) with well-marked symptoms of cholera, though not of so malignant a character as her's. His room was four doors above Sullivan's. He progressed

Evacuation of No. 10 Family Barrack. favourably, and was discharged convalescent on 18th May. On the morning of the 11th May, all the families residing in No. 10 Family Barrack were

Encampment in the fort. removed, and placed under canvas on an open space of ground inside the redoubt, situated on the bank of the river at the north-east end of the station,

The disease spreads. and about 350 yards from the nearest barrack, to leeward. Each family had a separate tent, and sanitary arrangements for the whole party were duly attended to. At 7 A.M. on the 11th May, (the same day as the families moved

It appears in No. 11 Family Barrack. out) the child of Private Dellury who had resided in No. 10 Barrack, in the next room to Private Hinton, was admitted from the camp with cholera, and died the following morning at 8 A.M. At 2 P.M. on the same day, Mrs. Jones, wife of Private Jones, residing in No. 11 Family Barrack, a block of buildings in a direct line with No. 10, but separated from it by a space of 60 yards, was

Fresh cases in camp in the fort. admitted with cholera. She recovered.

At 3. P.M. child M. Bawn was admitted from the camp, and died the same night at 10·30 P.M. in collapse.

A 4 P.M. Mrs. Griffin, wife of Private Griffin, was brought in from camp, with well-marked symptoms. She died the following evening at 7 P.M.

Progress of the disease. At the same time as the last case (Mrs. Griffin) was admitted, Mrs. Dippold, wife of Serjeant Dippold, was brought in from the camp with cholera. She recovered after a tedious convalescence.

Case of child McAlister. At 10 P.M. on the night of 11th May, the child McAlister was admitted from a detached bungalow on a healthy site, close to the Native Infantry lines, and a long way from the infected barrack. She had gone to bed in apparent health, and woke up about 9·30 P.M. with a cry of pain. Her parents tried some domestic remedies, but finding her getting worse, brought her to hospital. When admitted she was in collapse, and almost moribund. She died at 8 A.M. next morning, the 12th instant. The circumstances connected with child McAlister's seizure are highly interesting.

I have stated she resided in a detached bungalow some distance from the infected barrack. Her parents up to a fortnight previous to the outbreak in No. 10 Married Barrack, had resided in that very building, when her father being appointed Acting Barrack Serjeant, removed to the bungalow aforenamed. The child however was in the habit of attending school daily, and occasionally paid a visit to her old quarters. On the morning of the 10th May, the day after the outbreak, she breakfasted in No. 10 Barrack with the children Bawn (two of whom eventually died), and the following morning she returned to the building, and was present when its occupants were moving out to go into the Fort under canvas. That same night, as I have said before, she was seized with the disease and died in a few hours. This certainly looks very like contagion, at any rate it proves that the poison must have existed in that barrack in a highly concentrated form, and it must be presumed that there was something in the child's state of bodily health at the time, which

rendered her a fit and ready recipient of the poison. It is not likely that imagination or fear had anything to do with predisposing her. This is undoubtedly a predisposing cause with adults, but in a young child who probably did not know even the name of the disease, much less the terrors accompanying its progress, imagination would have very little part in the matter. It is natural to suppose that the delicate organization of children as compared with adults would render them more liable to be attacked, and it is undeniable that when the former do get cholera, their chances of recovery are very small. Yet so capricious is this extraordinary pest in selecting its victims, that the strong, healthy man is often knocked over, and the tender, delicate infant left unharmed. No other case occurred in McAlister's family.

Progress of the disease.

On the morning of the 12th May, about 9 A.M. another child (Bawn) was admitted from the camp in the Fort, in a state of collapse; it died at 2 P.M. the same day. At 6 P.M. of the 12th, Private Griffin (whose wife died the same evening) was admitted from camp in the Fort with well-marked symptoms; he recovered. At 5·30 P.M. on the 13th, Private Dellury (whose child died on the previous day, and on whom he had been in constant attendance) was admitted also from camp in the Fort. He died at 5·30 A.M., the next morning the 14th. On the morning of the 13th May, Mrs. Comerford, wife of the schoolmaster, who resided in No. 11 barrack, the same building whence Mrs. Jones was admitted on the 11th instant, was attacked with choleraic diarrhœa. The symptoms seemed to yield readily to treatment, and she was apparently convalescing, when on the 17th, secondary fever set in, and she died comatose on the evening of the 18th. On the morning of the 14th May, Private Jones, who had been in constant attendance on his wife since the 11th instant, was attacked, and died the following morning.

A case of choleraic diarrhœa in No. 11 married barrack.

Removal of families from fort to camp on brigade parade ground.

On the previous day (13th) I recommended to the Brigadier-General the removal of the families from the Fort to a camp on a more elevated and more easily isolated spot, on the brigade parade ground to the west, and at the same time to leeward of the barracks, and distant from the nearest (Artillery barrack) about 560 yards.

The following extract from an official letter will explain my views on the subject of this move:—

Letter to Brigade-Major, recommending removal of families to brigade parade ground.

"I have the honour to point out to the Brigadier-General Commanding, that "to properly fulfil the object of this move, and carry out with some hope of "success the separation of the infected from the healthy, it will be necessary "in this new camp, as far as possible to insist on isolation. If free promiscuous "communication is allowed between the barracks and the camp, the benefit of "the removal will probably be nullified. I would therefore beg most strongly "to recommend that the camp should be treated just as if it was 10 miles out of "the station, and have its separate establishment of cooks, sweepers, Toties, "and Bheesties, &c., the whole under the command of an officer. It will consequently be necessary that two hospitals should be pitched, one for women, "and one for men, and two native tents, one for a hospital privy, and one for "a Native dresser. It is of the very first importance that all sickness be treated "in the camp, and no cases should on any account be sent in from there to "Regimental Hospital. Our hospital establishment is certainly very small, but "in an emergency like the present we must do the best we can, and I am sure "Dr. McAllum* will render every assistance in his power if necessary to call "for it.

"I am also well aware that from insufficiency of tents and means of conveyance, &c., our hands are much tied; but I feel so convinced from former "experience, of the necessity for taking these steps now, so that in the event of "the epidemic increasing, we may be ready to deal with it, that I feel no "hesitation in laying these suggestions before Brigadier-General Nott, for "his serious consideration, being convinced that as far as our limited means go, "he will give his approval to the foregoing proposals."

The removal was effected on the 14th. A Native dresser was placed in medical charge, and the camp visited daily by a Medical Officer. Isolation as far as possible was carried out. The families remained under canvas 14 days, and enjoyed very good health. In the meantime the evacuated barracks were thoroughly cleansed and fumigated, in accordance with existing orders. Since

* Surgeon 36th M. N. I. and Civil Surgeon.

their re-occupation, they have been perfectly healthy. From the 14th to 29th May all traces of choleraic disease had disappeared, when, on the morning of the latter date, Private Arthur (residing in No. 12 Married Barrack, situated in a direct line with Nos. 10 and 11 to the westward, and distant from the latter 115 yards) was brought to hospital with well-marked symptoms of malignant cholera. He came to hospital the previous evening complaining of diarrhœa, got medicine and returned to his quarters. He felt relieved and easy till 2 A.M., when purging returned, and about 4 A.M. he was brought to hospital. He was very ill for some time, but finally recovered. There is no accounting for this case, all traces of the disease had apparently disappeared for a fortnight. Such solitary instances are however not uncommon at the close of an epidemic. Private Arthur is a steady, married man, of temperate habits, and usually in the enjoyment of good health. The sanitary condition of No. 12 Family Barrack was excellent. In a previous portion of this Report I stated that only one case of cholera had occurred amongst the Natives in cantonments since the 8th May, and to which reference would be made hereafter.

A solitary case occurs in No. 12 married barrack.

Mrs. Comerford's ayah, resident in Lascars' lines, seized with cholera on 16th May.

The case in question occurred on the 16th May in the person of a Native female, a resident of the Ordnance Lascars' lines, who was employed during the daytime in the capacity of ayah, by Mrs. Comerford, but who used to return to her home every night to sleep. She states that on the 16th May she was quite well up to 7 P.M., when she suddenly had a loose motion, at the time she was attending on Mrs. Comerford, who, as previously noticed, was attacked with choleraic diarrhœa on 13th, and died on 18th May. The ayah did not seem to attach any importance to the sudden attack of diarrhœa, which came on at 7 P.M., for she says she returned to her home in the Ordnance Lascars' lines, and ate her supper. At 8 P.M. diarrhœa again came on, and lasted at frequent intervals throughout the night; vomiting came on early in the morning; after that she got worse, and had cramps and coldness of surface. At 8 A.M. she was removed to the Royal Artillery Hospital, and the case pronounced to be genuine cholera; she ultimately recovered. With the exception of some native decoction, she got no medicine whatever until her arrival at the Royal Artillery Hospital, for the simple reason that no assistance was sought for until then, although both she and her friends knew it could be got in a few minutes, if they chose to ask for it. The case is interesting, inasmuch as it was the only instance of a Native employed in attendance on cholera patients during this epidemic in 76th Regiment being attacked with the disease.

Such is an outline of this first outbreak of cholera, from its commencement on 9th May, to its termination on 29th May. The annexed Table will show the cases in their order. It is very remarkable that none but married people and children should have been attacked, and that the disease should have clung exclusively to the range of family barracks. It expended its violence on No. 10, was less severe in No. 11, and least of all in No. 12. What peculiarity there should be in connection with either of those buildings which induced cholera poison to settle and germinate among the inmates, I have no means of ascertaining.

RETURN showing the Number of Men, Women, and Children, Her Majesty's 76th Regiment (Head-Quarters and Right Wing), stationed at Thayetmyo, Burmah, treated for Cholera and Choleraic Diarrhœa from 9th May, 1869, to 29th May, 1869.

[Strength on 9th May, 1869:—Officers, 10; men, 365; women, 43; children, 55.]

Number of Cases.	Date.	Names.	Disease.		Age.		Company.	Previous Health.	Habits.	Period in India.		Married or Single.	Hour of Admission.	How long previously suffering from Symptoms of Disease.	Where residing prior to outbreak of Cholera.	Whence Admitted.		Symptoms on Admission.					Result: Died			Recovered, and Date.
			Cholera.	Choleraic Diarrhœa.	Y.	M.				Y.	M.			Hours.	Barrack.	Barrack No.	Camp.	Vomiting of characteristic Discharges.	Rice-water Stools.	Cramp.	Collapse.	Suppression of Urine.	In stage of Collapse.	In stage of Reaction.	How long after Admission.	
1	1869. May 9	Mrs. S. Sullivan	Yes	...	26	0	10	Good	Temp.	0	4	M	1 P.M.	1½	10	10	...	Yes	Yes	Yes	Yes	Yes	Yes	...	Hrs. 15	...
2	,, 10	Private J. Hinton	Yes	...	31	0	8	Good	Temp.	11	4	M	5 P.M.	1½	10	10	...	Yes	Yes	Yes	Slight	No	...	...	...	May 18*
3	,, 11	Mrs. M. Jones	Yes	..	27	0	8	Good	Temp.	4	4	M	2 P.M.	2	11	11	...	Yes	Yes	Yes	Yes	No	...	..	...	,, 22¾
4	,, 11	Child M. Bawn	Yes	...	2	11	1	Good	Temp.	2	11	...	3 P.M.	1	10	...	Camp	Yes	Yes	Yes	Yes	Yes	Yes	...	7½	...
5	,, 11	Mrs. G. Dippold	Yes	...	33	0	3	Good	Temp.	4	4	M	4 P.M.	1	10	...	Camp	Yes	Yes	Yes	Yes	Yes	...	...	...	May 25
6	,, 11	Mrs. M. Griffin	Yes	...	27	0	1	Good	Temp.	4	4	M	4 P.M.	1	10	...	Camp	Yes	Yes	Yes	Yes	Yes	Yes	...	24	...
7	,, 11	Child M. McAlister	Yes	...	4	11	1	Good	Temp.	4	4	...	11 P.M.	1	Detached house out of barrack	Detached house out of barrack	...	Yes	Yes	Yes	Yes	Yes	Yes	...	9	...
8	,, 11	Child E. Bawn	Yes	...	4	0	1	Good	Temp.	4	0	...	11 P.M.	½	10	...	Camp	Yes	Yes	Yes	Yes	Yes	Yes	...	9	...
9	,, 12	Child B. Dellury	Yes	...	4	0	10	Good	Temp.	4	0	...	7 A.M.	½	10	...	Camp	Yes	Yes	Yes	Yes	Yes	Yes	...	13	...
10	,, 12	Private C. Griffin	Yes	...	32	0	1	Good	Temp.	4	4	M	8 P.M.	2	10	...	Camp	Yes	Yes	Yes	Yes	No	...	...	...	May 24
11	,, 13	Mrs. C. Comerford	...	Yes	32	0	3	Good	Temp.	5	4	M	4·50 P.M.	1	11	11	...	Choleraic	Choleraic	Slight	No	No	...	...	112	... †
12	,, 13	Private G. Dellury	Yes	...	28	0	10	Good	Temp.	8	6	M	5½ A.M.	½	10	...	Camp	Yes	Yes	Yes	Yes	Yes	Yes	...	12	...
13	,, 14	Private T. Jones	Yes	...	29	0	8	Good	Intemp.	5	4	M	6½ A.M.	½	11	11	...	Yes	Yes	Yes	Yes	Yes	Yes	...	22	...
14	,, 29	Private J. Arthur	Yes	...	28	0	10	Good	Temp.	10	3	M	4½ A.M.	½	12	12	...	Yes	Yes	Yes	Yes	Partial	...	...	...	June 9

* Since invalided for "hepatitis."

† Died on May 18 of secondary fever.

W. A. THOMSON, M.B., *Surgeon 76th Regiment.*

That cholera germs were present in an active form in the atmosphere of the station, from the time the disease commenced in the Coolie village, there can be, I imagine, little doubt. But why should these germs not have fructified more extensively amongst the people residing in the immediate neighbourhood of that village? The Artillery horsekeepers' lines, only separated from the village by a nullah (dry at that season), and having constant daily communication with it, although under good supervision, yet undoubtedly contained most of the supposed elements for fostering cholera. The horsekeepers have been to this hour intact.

The disease not only passed over the lines indicated, but also a portion of the Royal Artillery Barracks occupied by Staff Serjeants and their families, the Artillery guard-room, three blocks of single men's barracks (76th Regiment), and the 76th guard room and cells, before appearing among the occupants in No. 10 family barrack.

It travelled almost due south, and against the prevailing wind, which, at that season especially, and in fact generally throughout the year, with the exception of a few weeks in the cold weather, blows from south and south-west.

It will be seen on reference to the Appendix, that a certain portion of the Native followers attached both to the battery Royal Artillery, and to the 76th Regiment, lived in the Coolie village, and I have stated at the commencement of this Report, that one of the latter, a Toty (or scavenger), died of cholera on 25th April. These followers were daily employed about the barracks in their several avocations, and it may not unreasonably be concluded that they carried the disease with them. As however they were employed indiscriminately throughout all the buildings, married and single, it does not explain the infection of the former, and the exemption of the latter. Again, at the time of the outbreak, the ground floor of each of the family blocks, Nos. 10, 11, and 12, was being bricked, and a number of Native Coolies were employed daily on each. It struck me that perhaps those Natives might have come from Coolie village, and had something to do with introducing the disease into No. 10 barrack especially.

After a most careful enquiry, I found that only one (a mason) lived in the Coolie village, and that neither he nor any of the others, who all came from the town, had suffered from the disease, nor apparently had any of their relatives.

At no great distance from No. 10 barrack, and between it and the hospital, a swimming bath was in process of erection at the period under consideration. I have ascertained that two masons employed at this bath resided in the Coolie village. The first stated he was unmarried, and that there had been no cholera in or close to his home. The other stated he was married, and had lost a girl of six years old from cholera, while it was raging in the month of April in Coolie village. Both men stated that they had no communication with No. 10 family barrack.

To sum up the matter, there can be, I think, little doubt that cholera came to the 76th married people from the Coolie village.

How it was introduced, and why it should have attacked them in preference to others in their close vicinity, I cannot say.

State of the atmosphere during this epidemic.

It would be interesting to note the atmospheric changes existing at the time of this first outbreak, but unfortunately there are no meteorological instruments in the station. The 76th Hospital possesses an ordinary bath thermometer, which is hung up in a ward; it also has a rain-guage. No other instruments are provided.

Great heat.

The temperature, especially from the 9th to 12th May inclusive, was very high, and everyone complained of its great oppressiveness. Two fatal cases of heat-apoplexy occurred in the station at this period, one on the 10th, the other on the 12th May. The thermometer in the hospital ranged on those days from 101° to 98°. On the 13th May it went down to 90°, which was the daily maximum observed in the hospital from that date till the 16th inclusive.

Rain fall.

On the 11th, 15 cents of rain fell, on the 14th 60 cents, and on the 16th 1 inch 85 cents. This last fall had the effect of somewhat cooling the air.

No storms of importance.

There were no thunder-storms or dust-storms of any consequence at any time during this epidemic.

The prevailing winds were south and south-west, with occasional gusts from the north-east. Prevailing wind.

It will be remembered that the last case of cholera recorded in the preceding pages as occurring in the wing 76th Regiment was that of Private Arthur, on the 29th May.

Two months elapsed without a trace of this disease being observed either among the European or Native community, when on the 30th July, Private Trotter, 76th Regiment, a patient in hospital suffering from secondary syphilis since 21st July, was suddenly, and without any apparent reason, attacked with cholera about 11·30 A.M. Second outbreak of cholera in 76th Regt., 30th July, 1869.

He had been seen by me that morning at the usual hour of visit, and I made a remark in the case-book that he had been a little better the last day or two.

At 4 P.M. I made the following entry—"About ½ past 11 A.M. he (Private "Trotter) was observed to be sick at the stomach, to have an anxious expression, "and to be going frequently to stool. His stools soon assumed a choleraic "character. By ½ past 12 (noon) unmistakeable symptoms of malignant "cholera had set in; stools rice-water; vomiting the same. He had soon all "the appearance of the worst form of cholera.

"At 3·30 his symptoms were: tongue cold, breath cold, eyes dull, con-"stant vomiting and purging, constant and severe cramps all over the body, "skin cold and clammy, pulse a thread. At present (4·15 P.M.) there is "slight reaction. Pulse better. Vomiting continues.

"At 10 P.M. same report; pulse fluctuates remarkably, no urine passed "since forenoon; passed catheter, bladder empty."

Trotter was isolated as far as possible from the other patients, and tents pitched as before for the reception of fresh cases. On the 3rd day (2nd August) he seemed better, and gave slight hopes of recovery; reaction was going on gradually, and the various secretions becoming more active and natural. On the 5th day, however (4th August), symptoms of secondary fever set in, which rapidly increased, and on the morning of the 6th day (5th August) he died comatose.

On the morning of the 1st August a second case occurred in the person of Private Springett, 76th Regiment. He was an acting bandsman, and resided in the band bungalow to the north of, and at some little distance from, the barrack used as a hospital. On the morning of the 30th July he came to hospital at 7 A.M., complaining of a gumboil; he was ordered local remedies, and a purgative, and detained for the day. He occupied a bed in the ward in which Trotter was seized with cholera at noon on the 30th July. His bed was quite at the far end of the ward from Trotter's. That portion of the hospital was soon after Trotter's seizure entirely evacuated, no one being left in it but Trotter. A second case occurs 1st August.

On the morning of the 31st July, Springett again presented himself, complaining of pain in the hepatic region. He was ordered a sinapism, and to be detained under observation. In the afternoon he complained of simple diarrhœa: his stools were carefully watched, and appropriate treatment used, but it was not till the next morning, 1st August, at 6 A.M., that choleraic symptoms showed themselves. He was then removed to a tent. He eventually recovered from cholera, but has since been invalided for chronic hepatitis. Whether he had the seeds of the disease in his system before he came to hospital, or contracted it in hospital while under observation for hepatic derangement, it is impossible to determine, but the latter is most likely the case, as there was no cholera reported in the town till 7th August, and I have no proof that Springett had intercourse with any stranger coming from any place in the interior where the disease might at that time have been in existence. No other member of the band was afterwards affected with cholera. Why the disease should reappear so suddenly in the barrack used as a hospital, after a lapse of two months since the last case in No. 12 married bungalow, I am unable to explain. The sanitary condition of the hospital and its surroundings, was so far as I could detect, perfect. On the evening of 4th August, Private Hunter, 76th Regiment, a patient in hospital with fever since 18th July, was attacked. At the morning visit he complained of diarrhœa, and was put under close observation, and ordered appropriate treatment. At 6 P.M. rice-water stools began to show, A third case occurs, a patient in hospital, 4th Aug.

soon followed by other characteristic signs of cholera. He was immediately removed to a tent. He recovered, but his convalescence was somewhat tedious.

Evacuation of the hospital building.

In consequence of this last instance, I deemed it advisable to recommend the entire evacuation of the hospital building, and removal of the sick to a barrack close at hand, occupied by No. 3 Company, 76th Regiment, the Company being meanwhile accommodated elsewhere. This removal was accomplished on the morning of 5th August, No. 3 Company having been previously distributed into two other barracks, and thus all over-crowding of the men avoided. The abandoned hospital was thoroughly cleansed, fumigated, and ventilated, and all the out-buildings connected with it, special attention being directed to the latrine.

State of the atmosphere.

The atmosphere at this time was particularly muggy, close, and depressing, laden with moisture, but very little rain falling; an unusual state of things at this season, which is generally marked by a heavy rainfall.

Everyone complained of the oppressiveness of the air, which seemed to affect most people with an undefinable idea of unhealthiness.

A fourth case occurs in barracks, 5th August.

On the evening of 5th August, at 8 P.M., Private Allum, 76th Regiment, was admitted from No. 8 Company barrack into the hospital tent with cholera. His case was marked soon after admission by severe cramps, along with vomiting and purging of characteristic discharges, and a strong tendency to collapse. It was ascertained after his admission, from his own statement, that he had been suffering from severe diarrhœa all day, but although he knew that his Colour-Serjeant was provided with medicines, and that strict orders were issued to all men to report themselves and seek relief the moment they felt uneasy in their bowels, yet he did not do so, "because he thought it would wear off." He eventually recovered.

A fifth case occurs, a patient in hospital, 7th August.

At 9·15 A.M. of the 7th August, Private Coombs, 76th Regiment, a patient in hospital, suffering from dyspepsia, accompanied with debility, and a tendency to irregular paroxysms of ague, was seized with cholera. His case from the first seemed hopeless, his previous weak state being greatly against him. He died at 9 o'clock the same night in collapse. It was particularly observed that strong muscular contractions of the hands, with partial upliftings of each forearm, contractions of the toes, and great heat of the inside of thighs, continued for fully one hour after life appeared to be quite extinct.

Appearance of cholera in the Native town of Thayetmyo, 7th August.

On the morning of 7th August, the Assistant-Commissioner of Thayetmyo reported a supposed death from cholera on the previous night in the town. The subject was said to have arrived from Prome the same evening, and to have been ill for two or three days before his arrival.

On the following day, 8th August, the Civil Surgeon reported three cases of cholera in the town, and one death. On 9th August two fresh cases and one death. On 10th August, nine fresh cases, and eight deaths. The disease continued in the Native town till 5th September.

The total cases reported from 8th August to 5th September were 47, viz.:—

Table of Cholera in Native Town of Thayetmyo.

	Men.	Women.	Children.	Total.
Admitted from 8th August to 5th September ..	12	14	21	47
Discharged " " " ..	4	5	4	13
Died " " " ..	8	9	17	34

The disease appears to have been most prevalent amongst children, and as usual the mortality very high. It is believed that many more cases occurred than those reported, so that the statistics given cannot be relied on as affording a correct estimate of the numbers attacked, or of the rate of mortality.

During the prevalence of cholera in the native town, the troops were cautioned not to visit it, except when obliged to do so, to purchase the necessaries of life.

The disease, as it existed in the neighbouring country, will be referred to hereafter.

From the 7th to the 30th August, there was observed a tendency to diarrhœa amongst the men of the 76th Regiment, but not among the Royal Artillery or Native troops.

Tendency to diarrhœa in 76th Regiment from 7th to 30th August.

On 22nd August, a patient in 76th hospital, suffering from fever, was suddenly attacked with diarrhœa, which at first showed a strong tendency to become choleraic. Happily, however, the prompt treatment adopted proved successful, and in the course of a couple of hours all unpleasant symptoms had disappeared. So suspicious a case occurring fifteen days since the last instance of cholera sufficed to show that the disease still lurked among us.

A suspicious case in hospital, 76th Regiment, 22nd August.

Nothing further of note occurred till 30th August, when Private Prior, 76th Regiment, a patient in hospital suffering from fever, was suddenly attacked with cholera. He was immediately removed to a tent for treatment. His case was at first considered hopeless, his weak state, when seized being greatly against him; but eventually he recovered after a tedious convalescence, and has since been invalided.

Third outbreak of cholera in 76th Regiment, 30th August; a patient in hospital.

It had been arranged that on this day the patients should be removed back into the hospital, which was evacuated on the 5th August, and which had in the meantime been carefully cleansed, fumigated, and ventilated. The occurrence of this fresh case of cholera was an additional incentive for doing so, as it was the second which had within the month originated in the barrack temporarily occupied as a hospital. The removal of the patients was accordingly effected, and the evacuated barrack thoroughly cleansed and fumigated, and left open and unoccupied until the 20th September, a period of three weeks being allowed to elapse before the company returned to it.

No. 2 Barrack evacuated by the sick, who are re-transferred to the hospital.

All the sanitary, precautionary, and preventive measures which from the first had been recommended, were if possible more strictly enforced than ever. In addition to the tents for treatment of cholera cases, an observation tent was pitched for the reception of men with symptoms of diarrhœa or cholera malaise, so that, if possible, no case likely to develope into cholera should be admitted into the hospital at all. On the afternoon of 2nd September, a fresh case occurred in the Staff-Serjeant's quarters, 76th Rigiment, a new building well-constructed in a good and elevated situation, raised 10 feet 6 inches from the ground, and apparently in excellent sanitary condition.

Precautionary measures continued in full force.

The disease appears in the Staff-Serjeants' quarters, 76 th Regiment, 2nd September.

It is placed at the eastern end of the regimental lines, in the direction of the river, and is 130 yards distant from No. 10 Married Barrack, where cholera first appeared in May.

Position of building.

The subject of this fresh attack was a fine healthy boy, aged 3 years and 8 months, step-son of the Orderly-Room Clerk, 76th Regiment. He was suddenly attacked at 4 P.M., having been previously in good health, and died at 5 A.M. the following morning, 3rd September. Violent convulsions, followed by complete left hemiplegia, occurred three hours before death. The quarters in which the child was attacked were vacated as soon as the disease was detected, and the occupants removed to an empty school-room in the vicinity. The child was treated in a tent.

Case of Child Taylor; fatal result. Convulsions and hemiplegia precede death.

On the forenoon of 6th September, the Orderly-Room Clerk himself, Serjeant Walsh, 76th Regiment, came to hospital complaining of looseness and malaise. He was detained in the observation tent, and actively treated. His stools at this time were of a pea-soupy character, and contained masses of undigested meat and fat. Previous to the attack he was in good health. His countenance and manner expressed anxiety, and although stimulants and sedatives were given, and means taken to divert his mind, and if possible induce a cheerful train of thought, yet he passed a restless night and had no sleep.

Orderly-room Clerk, 76th, attacked with premonitory diarrhœa, 6th September.

At 6 A.M. next morning, the 7th September, rice-water stools, vomiting, and cramps set in, and his case was pronounced one of cholera. He recovered, but not without a struggle. Secondary fever set in, with cerebral complication, on the 8th September; and from that date till the 12th he could neither collect nor concentrate his ideas properly; he misplaced his words in a most peculiar manner, calling common things by wrong names. At the same time partial paralysis of the left lower extremity, from the hip to the foot, was observed. His convalescence was tedious. He suffered for some time from weakness of the left leg, complaining of numbness and dragging after walking

Orderly-room Clerk attacked with cholera, 7th September.

a short distance, and being easily fatigued. He was also liable to severe headache, if he attempted to read or write for a short time. On 9th November he was sent to Rangoon, *en route* to Wellington, in the Neilgherries, to which place he was recommended for change by a Medical Board. His health was considerably improved at the time of his departure.

Another case occurs in the Staff-Serjeants' quarters, 8th September.

Early on the morning of the 8th September, the infant daughter of Drum-Major Butcher, 76th Regiment, aged 1 year and 8 months, residing with its parents in the Staff-Serjeants' quarters, in rooms adjoining those vacated by the Orderly-Room Clerk on the 2nd instant, was attacked with cholera. The case ran its course rapidly to a fatal termination. Sudden convulsions, followed by complete left hemiplegia, came on at 9 P.M., and she died at 9·30 P.M., 16 hours after admission.

Fatal issue.

Convulsions and hemiplegia precede death.

The necessity for evacuating the whole of the building occupied by the Staff-Serjeants was now imperative. In view of this necessity arising, as well as to be prepared for the removal of men from barracks should the disease spread, a preliminary camp, capable of accommodating a company and a certain proportion of married people, had been pitched on the brigade parade-ground a few days before. On the 8th September, therefore, the occupants of the Staff-Serjeants' quarters were removed to the camp in question. A special hospital establishment was provided for the camp, and a Medical subordinate placed in charge. A Medical Officer visited the camp morning and evening. All unnecessary communication between the camp and cantonment was prevented.

Evacuation of Staff Serjeants' quarters.

Preliminary camp.

The families remained under canvas for 14 days, and enjoyed excellent health. Meanwhile their quarters were thoroughly cleansed, fumigated, and ventilated. The building was re-occupied on 21st September; there has been no sickness in it since. Such is an outline of the third outbreak of cholera this year in the 76th Regiment.

The following Tables will show the cases as they occurred in the second and third outbreaks, and also a summary of all the cases from first to last :—

RETURN showing the Number of Men, Women, and Children, Her Majesty's 76th Regiment (Head-Quarters and Right Wing) stationed at Thayetmyo, Burmah, treated for Cholera and Choleraic Diarrhœa, from 30th July to 8th September, 1869.

[Strength on 30th July, 1869:—Officers, 15; men, 340; women, 41; children, 47.]

No. of Case.	Date.	Names.	Diseases. Cholera.	Diseases. Choleraic Diarrhœa.	Age.	Company.	Previous health.	Habits.	Period in India.	Married or single.	Hour of admission.	How long previously suffering from symptoms of disease.	Where residing previous to outbreak of disease.	Whence admitted. Barrack No.	Whence admitted. Hospital and cause of original admission.	Symptoms on admission. Vomiting of characteristic discharges.	Rice-water stools.	Cramps.	Collapse.	Suppression of urine.	Result—Died. In state of Collapse.	Result—Died. In state of reaction.	Result—Died. How long after admission.	Recovered and date.
	1869				Y. M.				Y. M.			Hour.											Days.	
1	30 July	Private J. Trotter... ...	Yes	...	29 0	1	Delicate	Temp.	5 3	S.	12 A.M.	½	Barrack	...	Hospital; secondary syphilis	Yes	Yes	Yes	Yes	Yes	...	Yes	6½	...
2	1 Aug.	,, T. Springett ...	Yes	...	19 0	10	Good	,,	0 8	S.	6 A.M.	½	Band-Barrack	Band-Barrack	...	Yes	Yes	Yes	Yes	No.	...	...	...	14 Aug.*
3	4 ,,	,, G. Hunter	Yes	...	30 0	8	Delicate	,,	8 9	S.	6 P.M.	¼	Barrack	...	Hospital; ague irreg.	Yes	Yes	Yes	Yes	Partial	...	...	...	18 Aug.
4	5 ,,	,, W. Allum	Yes	...	24 0	8	Good	,,	5 7	S.	10 P.M.	1	Barrack	Barrack	...	Yes	Yes	Yes	Yes	Partial	...	...	...	18 Aug.
5	7 ,,	,, R. Coombs ...	Yes	...	36 0	7	Delicate	,,	5 7	S.	9 A.M.	¼	Barrack	...	Hospital; dyspepsia	Yes	Yes	Yes	Yes	Partial	Yes	...	Hours. 13	...
6	30 ,,	,, C. Pryor	Yes	...	21 0	7	Delicate	,,	0 9	S.	10 A.M.	½	Barrack	...	Hospital; continued fever	Yes	Yes	Yes	Yes	Yes	...	...	...	17 Sept.†
7	2 Sept.	Child C. Taylor	Yes	...	3 8	10	Good	...	3 8	...	4 P.M.	1	Staff Serjeants' Quarters	Staff Serjeants' Quarters	...	Yes	Yes	Yes	Yes	Yes	...	Yes	Hours. 13	...
8	7 ,,	Orderly-room Clerk, Serjt. T. Walsh.	Yes	...	24 7	10	Good	Temp.	3 5	M	6 A.M.	1	,,	Old School-house	...	Yes	Yes	Yes	Yes	Yes	...	...	...	7 Oct.†
9	8 ,,	Child E. J. Butcher ...	Yes	...	1 8	3	Delicate	...	1 8	...	6 A.M.	1	,,	Staff Serjeants' Quarters	...	Yes	Yes	Yes	Yes	Yes	Yes	...	Hours. 15½	...

* Since invalided, (hepatitis).

† Since invalided. Death preceded by convulsions, and left hemiplegia.

W. A. THOMSON, M.B., *Surgeon, 76th Regiment.*

TABLE showing the Total Admissions and Deaths from Cholera and Choleraic Diarrhœa in the Head-Quarters and Right Wing, 76th Regiment, at Thayetmyo, from 9th May, 1869, to 8th September, 1869.

	Men.	Women.	Children.	Total.
Admitted	12	5	6	23
Died	4	3	6	13
Recovered	8	2	..	10

NOTE.—There was only one admission from "choleraic diarrhœa," and that proved fatal in the person of the wife of the Regimental Schoolmaster.

Origin and progress of cholera in Thayetmyo in 1869.

At the commencement of this Report I have stated that cholera seemed to originate in the Coolie village, in the month of April 1869. I am unable to discover, after careful enquiry, that the disease was imported into the village. The Assistant Commissioner (*vide* his letter in the Appendix) says the disease originated there. The native residents (*vide* Appendix) say it was considered by themselves and their priests, or poonghees, to arise from the great heat of the weather causing fermentation of the blood. I have further expressed my opinion that the disease was somehow or other conveyed to the 76th barracks from the village.

The origin of the second and third outbreaks I can only account for from the accepted fact that cholera, once establishing itself in a locality in an epidemic form for a certain period, is apt to suddenly disappear and as suddenly reappear at intervals of a few weeks, so long as the disease exists in the neighbourhood, so long, in fact, as the epidemic influence, whatever that may be, remains. This is neither a scientific nor a satisfactory explanation, but it is no less consistent with facts which have been recorded by many experienced observers.

Theories advanced at Thayetmyo by amateurs.

Many theories were advanced by non-professional amateurs as to the cause of cholera, and its preference for the barracks of the 76th Regiment. The only one worthy of notice was the idea that the disease might have been fostered by the use of water drawn from a well in rear of the canteen, 76th Regiment, and in the vicinity of No. 10 married bungalow, and near to which two old closed-up cess-pits existed. The one cess-pit is 36 yards, the other 54 yards, from the well. When in use, these cesspits were employed in connection with an old disused privy (demolished last year), for the reception, I am told, of both solid and fluid excreta; but they were filled up with earth, charcoal, &c., and closed in March or April 1863, and have never been disturbed since, over six years ago. Their depth is supposed to have been from 40 to 50 feet; and it is quite consistent with our knowledge of these matters to believe that a well situated so near them as the one in question would have its water contaminated. Since the 12th August, 1869, it has been closed, and samples of the water forwarded to Madras for analysis, there being no means of doing so at this station. The result* of the analysis is not yet known. My own belief is that the use of the water from this well had no bad influence on the health of the troops. It was used from the arrival of the 76th Regiment in February 1868 till August 1869 (when it was closed) by the following persons, viz.:—Serjeants' mess, 76th Regiment; Staff-Serjeants' mess, ditto; canteen, ditto; band, ditto; No. 10 married barrack, ditto.

Well in rear of 76th canteen.

With the exception of the inhabitants of No. 10 married barrack, who suffered from cholera in May 1869, none of the others mentioned above were attacked up to the time the well was closed.

Localization of the disease in 76th lines.

There is no doubt that the disease confined itself mainly to a fixed radius in the lines of the 76th. I cannot account for this preference for one locality. This fondness for localization, however, is often met with during epidemic visitations, and is evidently one of the peculiarities of the disease.

Perhaps there existed in the vicinity of the buildings more particularly

* The result has since been communicated, and water pronounced good. *Vide* "Analysis" in Appendix, section IV.

affected with cholera, some organic substance which has the property of assisting the propagation of the poison, and afterwards, for a time at least, maintaining it in a state of activity. What this substance, or influence, or atom may be, has yet to be discovered. I have stated before, that, as far as ocular examination went, there was nothing of an insanitary character to be discovered in the buildings attacked, or in their vicinity. Should the scourge visit the cantonment next year, it will probably select a different site for its ravages. Speculation as to the cause of localization.

With regard to the epidemic which raged in the Native town from 8th August to 5th September, and which has been previously noticed, I have not much to add, except that I think it is possible, if no cases occurred prior to the first-named date, that the disease was introduced among the inhabitants by the man who arrived from Prome on the afternoon of 6th August, and died of cholera the same night, but not probable; I think it was merely a coincidence. On the other hand, it may be said that the disease advanced steadily southwards from the Coolie village in a straight line, and in the natural course of its progress attacked the Native town. If so, its progress was very slow, considering the close proximity of the localities, and the constant uninterrupted daily communication between them. If this theory is adopted, then we must state it as follows, viz.:—Cholera appeared in the Coolie village about the 12th April, in the barracks 76th Regiment on 9th May, lay dormant there from 29th May till 30th July, when it re-appeared in 76th hospital, and finally broke out in the Native town on the 8th August. For my own part, I consider this line of reasoning quite fallacious, as I have ascertained that cholera raged in the city of Mandalay during the months of July and August, if not earlier, and also in three villages beyond the frontier, viz., Pokokkon, about 100 miles north-west of Thayetmyo; Myengyan, about 150 miles north-east; and Myantha, about 100 miles north-west. It also existed in the month of July, in seven villages in the Prome district to the east of Thayetmyo, and on the opposite bank of the river. The names of those places, with the dates and number of cases, will be found in the Assistant Commissioner's letter (*vide* Appendix). The communication between Mandalay and Thayetmyo is by means of steamers, both Burman and British, which ply on the Irawaddy regularly between the Burman capital and Rangoon once or twice a month, conveying passengers and merchandize. Native boats in large numbers are also constantly passing to and fro. No attempt at quarantine, or even at sanitary inspection of the vessels named, seems to have been made at Thayetmyo at this time. It is therefore more than probable that those vessels have been the means of scattering the disease far and wide over the province. Speculation as to the cause of the epidemic in the Native town.

The Assistant Commissioner in his letter (*vide* Appendix) states that there is very little intercourse between the villages to the east of Thayetmyo and Thayetmyo itself, because they lie on the east side of the river. It is not necessary to have frequent intercourse between places to carry cholera from one to the other; the disease may be conveyed by a single individual. I regret that I am not at present in a position to give anything like a satisfactory account of the progress of the disease in Upper Burmah, and in the British provinces in which Thayetmyo is situated. I find it next to impossible to get accurate information, especially with regard to Upper Burmah. It is said the King endeavours to suppress all reports on the subject in Mandalay and the surrounding country, hence much that is communicated to us is mere hearsay, and therefore of little value. I see no way of obtaining this information unless Government sets an enquiry on foot, through the Chief Commissioner of British Burmah, and the British Resident at Mandalay; and considering not only the interest, but the vital importance of the subject, I think the suggestion is worthy of consideration.

All the information I have been able to gain, with regard to the disease in the Prome district, will be found in the Assistant Commissioner's letter before alluded to (*vide* Appendix).

With regard to treatment I have nothing new to offer. Treatment of cholera.

In the recent epidemic in 76th Regiment, almost every patient who recovered suffered from a painful eruption of boils on the face, trunk, and extremities. In one instance severe otitis and parotitis occurred as sequelæ, from which the patient, a woman, took a long time to recover.

Change of climate is frequently desirable and necessary to restore health after an attack of cholera. Four men of the 76th have been this year invalided on that account.

Sanitary precautions and preventive measures to be observed during an epidemic of cholera.

The principal sanitary and preventive measures adopted during the existence of cholera in 76th Regiment at Thayetmyo, have been referred to already in this Report, when detailing the progress of the disease. There are, however, one or two points which I wish to speak of more fully in detail:—

Rations.

1. With regard to the food of the troops at Thayetmyo, although the quality of the rations is good, and the quantity probably sufficient, yet there is a great want of variety. Beef is the article furnished daily, mutton being only issued twice a year—namely, on Christmas Day and New Year's Day—owing to the expense of keeping up a supply of sheep. Mutton is issued to the hospitals every second day, and is of excellent quality. Salt pork or salt beef is issued once a fortnight, but the men don't seem to care about it.

Potatoes are issued as regularly as they can be procured, or in lieu of them preserved potatoes, sweet potatoes, yams, pumpkins, and onions; but in the cold season, when in India, carrots, turnips, peas, cabbages, cauliflowers, &c., are in most places abundant, in Thayetmyo no European vegetables are procurable for the troops. They would grow well enough, as is proved in officers' private gardens. In the hot and damp months from May to October, when all feel more or less depressed, the appetite is very apt to pall at common food. If such is the case with those whose means enable them to purchase luxuries, what must it be with the private soldier?

Men who are at all delicate loathe the constant beef ration, and eat all sorts of things to satisfy the caprices of their appetites. Some live for weeks on cheese and sardines and such like, which they buy from the regimental coffee-shop. Eggs, fowls, milk, and butter are, as a rule, more expensive here than in India. During the height of cholera this year, I supplied several delicate men in barracks with comforts from hospital, as recommended and sanctioned in the pamphlet entitled "Measures for the Prevention of Cholera among European Troops in Northern India," page 30, para. 522. This system, I am confident, was attended with much benefit.

Cooking.

2. The cooking, although not worse than in many Indian stations, yet is very indifferent, and will continue so until proper cooking ranges are introduced. Duff's range has, I believe, been long since recommended, but as yet there is no sign of its being supplied. I took occasion, during the recent epidemic, to draw the attention of the Officer Commanding 76th Regiment to the shortcomings of the Native cooks, and pointed out some objectionable practices of theirs which might by a little pressure be prevented. Strict orders were given by the Commanding Officer on the subject, in accordance with my suggestion.

Issue of hot coffee or tea.

3. Hot coffee or tea has always been available early in the morning for such men as chose to go to the regimental coffee-shop for it. During the existence of cholera, however, the Commanding Officer made arrangements by which these beverages could be had close to the parade-ground, so that no man should have any excuse for saying that his barrack was too far from the coffee-shop, and that he had no time to go to it before parade. The price charged for each cup of coffee or tea was half an anna.

I suggested the issue of coffee to men on night sentry as a prophylactic measure. This was given gratuitously, the expense being, I believe, defrayed out of one of the regimental funds.

Flannel belts.

4. I recommended flannel abdominal belts to be worn, especially at night. Regarding these belts, I would observe that they are usually made of much too thick and heavy material, consequently many who wear them, especially in the day time, find them so oppressively hot that they are very apt to suddenly throw them off, and by so doing to expose themselves to a chill, and are therefore much more likely to suffer injury than if they had gone without them altogether. If made of a lighter material they would be equally efficacious, and not so open to objection as the pattern at present issued.

Disinfection of barracks, latrines, bedding, &c.

5. With regard to the disinfection of barracks, latrines, and other outbuildings, to the purification of bedding and clothing, and, when necessary, their destruction by burning, the rules laid down for guidance on those points were strictly adhered to. The same remark applies to the abandonment of

infected buildings, and encampment at a distance of the occupants, the isolation of cholera patients, and the disposal of cholera evacuations.

Employment of Natives in attendance on cholera patients.

6. When the first outbreak took place in May last, in 76th Regiment, there was difficulty in getting natives as attendants on cholera patients, consequently European orderlies had to be employed. Latterly, however, this difficulty was not experienced, and it was found unnecessary to employ European soldiers any longer in that capacity.

Insufficient supply of camp equipage at Thayetmyo.

7. When cholera made its appearance in the 76th Regiment, in May 1869, I reported to Dr. Shelton, Principal Medical Officer, British Medical Service, Rangoon, the insufficiency of camp equipage in store at Thayetmyo, should it be necessary to place any number of men under canvas. I was aware that a certain portion of the camp equipment had been sent to the experimental sanitarium at Nyoung Gyo for the use of the troops temporarily occupying that spot, but was convinced that even had the full complement allowed to the garrison been present in Thayetmyo Arsenal, it would have been insufficient to meet the requirements of a serious outbreak of cholera. Dr. Shelton reported the circumstances to Inspector-General Hadaway in Madras, by whom the matter was referred to the Commander-in-Chief, through the Quarter-master-General.

At page 13, para. 471, of the pamphlet, "Measures for the Prevention of Cholera among European Troops," published in 1864 under the head, "Supply of Camp Equipage," are the following remarks:—"Although, if the "measures we recommend are carried out, the encampment of the whole of "the European force at any station will perhaps not often be necessary at "one time, we must nevertheless anticipate this possibility. The ordinary "supply of camp equipage will not always be sufficient for these emergencies.

"The number of tents allowed for each regiment is calculated at the rate "of sixteen men per tent, but when beds are put into them not more than "eight men can be accommodated in each.

"Even if no beds were taken, this number ought hardly to be exceeded. "We recommend that the proper authorities be required to report upon the "best and most economical way of providing the additional camp equipage "required for each station, &c."

On the 9th August, 1869, during the second outbreak of cholera in 76th Regiment, the following telegram was received by the Brigade-Major from Dr. Shelton, viz.:—

"*To Thayetmyo, Brigade-Major. From Rangoon.*

"Inspector-General, British troops, recommends by telegram that should "other cases of cholera have occurred in 76th, that regiment be sent into "camp at once."

It was found impracticable, however, on either of these occasions to carry this out.

I trust, however, that this matter, which is one of such vital consequence to the garrison of Thayetmyo, will attract notice, and that before next hot season we may have such a supply of tents provided as will relieve our minds of all anxiety, at least on that score, should another epidemic of cholera unhappily assail us.*

Cholera camp near Thayetmyo.

8. Two spots were used for encamping the families attacked with cholera this year—namely, an open space inside the redoubt, and the brigade exercising ground. Of the former I do not approve, as it is too confined and not sufficiently isolated. The latter answers very well for a preliminary camp.

A regular camping ground was chosen a year or two ago on the top of a hill to the north of the station. The soil is gravelly. The site is covered with trees and underwood. The underwood should be always kept clear in

* The supply of additional camp equipage in cases of emergency has been provided for in par. 66 of the "Rules regarding the measures to be adopted on the outbreak of Cholera," &c., G.O.C.C., dated 3rd August, 1870, by directing that extra camp equipage should be indented for by the Commanding Officer on the nearest magazine, the indent to be countersigned by the Deputy Inspector-General of the Circle, or Senior Medical Officer, and by the Officer Commanding the Station.

anticipation of the camp being occupied. It commands a fine view of the Irawaddy, and is altogether a cheerful locality. It is distant 2,600 yards from the northern boundary of the cantonment, and is 100 feet above high-water mark. There is ample room to encamp the whole European garrison on the ridge if necessary. Abundance of good water can be obtained all the year round from a creek of the Irawaddy, which runs up to within a short distance of the foot of the hill. Access to this camp has hitherto been only possible for men on foot, ponies, or elephants, but not for wheeled vehicles, except perhaps the rough country carts. A good driving road, however, is now under construction, and will shortly be completed.

A second cholera camp across the Irawaddy very desirable.

The station of Thayetmyo is situated in a sort of amphitheatre; a range of low wooded hills bounds it on the south, west, and north sides, and the river Irawaddy on the east. It covers a space which is much circumscribed, and as there are no roads beyond mere rough tracks into the interior, and on the high grounds, great difficulty in obtaining a ready and good supply of water is experienced, and there is very poor opportunity afforded for selecting sites for cholera encampments. At present, as I have just stated, there is but one. It is obvious, however, that one camp is insufficient, as should at any time a serious epidemic of cholera rage amongst the troops, it might, and in all probability would, be found necessary to move in various directions. I would therefore strongly recommend the selection of one or two new sites on the other side of the river. I believe there is an excellent site at no distance from the bank, which was recommended to the notice of the authorities over two years ago by the Committee which selected the camp on this side the river, but this good suggestion has not yet been adopted. I beg to bring this point also especially to notice. The advantage of crossing rivers to escape from cholera has frequently been pointed out by writers on the subject, and recently has been particularly insisted on "whenever practicable" by Inspector-General Beatson, M.D., C.B, British Medical Service, and Inspector-General Murray, M.D., Indian Medical Service.

Absence of sanitary precautions on the River Irawaddy.

9. I have previously stated that there is constant communication between Upper Burmah and Thayetmyo by steamers and Native boats, which ply on the Irawaddy; I have also pointed out that cholera was known to rage at Mandalay this year, and probably at many of the villages on the river bank, but that so far as I could ascertain no special attention was paid to the fact, or care taken to inspect the steamers or boats with a view to ascertain their sanitary condition. I consider this state of things represents an important defect in our sanitary administration in this part of the world, and therefore desire to bring it publicly to notice, with a view to its remedy. The residents at Thayetmyo are exposed to danger by those vessels, as are also those at Prome and the other British stations, including Rangoon. When cholera was present in the 76th Regiment, we were forbidden to send our invalids or time-expired men to Rangoon until a certain period had elapsed since the occurrence of the last case, as it was thought it might communicate the disease to the troops in Rangoon. The precaution was undoubtedly a wise and proper one on the part of the Principal Medical Officer, British Troops. At the same time, however, free communication was permitted by the Civil authorities between all stations along the river banks without let or hindrance, and I have no doubt that the disease was disseminated among the population in that way, although I have no facts to prove the assertion. That the sanitary condition of all the vessels, and especially of the flats belonging to the Irawaddy Flotilla Company, in which our soldiers are conveyed, requires strict supervision, the following letter, which I found it necessary to address on the subject to the Brigadier General Commanding at Thayetmyo, abundantly proves:—

"No. 120.

"*From Senior Medical Officer, British Medical Service, Thayetmyo, to Brigade-Major, Thayetmyo.*

"Sir, "*Thayetmyo, 17th September*, 1869.

"I have the honour to report, for the information of the Brigadier-General "Commanding, that I inspected the steamer 'Colonel Phayre' and its flat this "morning, with a view to ascertain the nature of the accommodation provided "for the details Royal Artillery and 76th, about to proceed to Rangoon, viz:—

Transfers and time-expired	16
Invalids	20
Women	7
Children	9
	52

"With an officer in command, a hospital dresser in medical charge, and a staff of Native followers.

"2. I was surprised to find that only a portion of the upper deck of the "flat had been set apart for the troops.

"It cannot be stated that they have the use of the whole upper deck, "inasmuch as a considerable portion of one end is screened off for the use of "cabin passengers, and no small space at the other end is taken up by sheep "and fowl pens, and a cooking galley.

"3. It is therefore impossible that there can be sufficient deck room left to "provide accommodation for a screened hospital to hold four men and a "dresser, and a screened berth for the married people, another for a Staff Ser- "jeant, and at the same time give each man the full amount of space allowed "by Regulation.

"4. The state of the main deck of the flat, I consider to be, in a sanitary "point of view, highly objectionable.

"It is crowded with Natives and their families and merchandize, and in "addition to the human freight conveys no less than 16 ponies.

"If bad smells are proofs of faulty sanitary arrangements, then the state of "this deck must be bad indeed, for the stench which proceeds from it is "simply abominable.

"5. I am well aware that every care is exercised by the commander of the "steamer to keep his decks sweet and clean, but I cannot see how it is possible "to do so under the circumstances mentioned.

"6. At a time like the present, when we have cholera hanging over us, and "ever and again breaking out when and where least expected, it is more espe- "cially necessary to enforce the strictest attention to sanitary measures, and "where can it be more essential than on board vessels crowded with Natives?

"7. From all accounts, the city of Mandalay, whence the 'Colonel Phayre' "has just arrived, is infected with cholera, and has been so for some time.

"Hence an additional reason why stringent sanitary rules should be "enforced in these river steamers and flats.

"8. I beg to record my opinion that when troops, and especially invalids, "are being sent to Rangoon from this station, neither Natives nor horses "should be permitted as passengers on board the same flat.

"9. I would further recommend that in future it should be insisted on "that the proper space allowed by Government to each man be invariably "provided.

"10. Were it not that our invalids and time-expired men have been already "twice prevented from starting on account of cholera, I should have con- "sidered it advisable on this occasion, to recommend that they be detained, "until proper means of conveyance were found for them. The voyage is likely "to be a short one, and it is to be hoped it will go well.

"Nevertheless I must state my conviction that it is attended with risk, and "that in case of sickness breaking out on board, it would be advisable to send "a Medical Officer in addition to the hospital dresser.

"11. In conclusion, I have the honour to request that this letter may be "forwarded to the divisional authorities, and submitted for their serious con- "sideration, in order that the whole subject of the transport of troops between "Thayetmyo and Rangoon be thoroughly investigated.

"I have, &c.

"W. A. THOMSON, *M.B.*,

"*Surgeon, 76th Regiment,*

"*Senior Medical Officer, British Medical Service.*

A copy of the above letter was forwarded to the Principal Medical Officer, Rangoon, who lost no time in bringing the subject to the notice of the divisional authorities.

APPENDIX TO REPORT ON CHOLERA AT THAYETMYO IN 1869.

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SECTION I.
Evidence regarding cholera in Coolie village, from residents of the same.

SECTION II.
Letter to Assistant Commissioner, Thayetmyo, seeking information regarding cholera in the town and district, with his reply.

SECTION III.
Answers to queries contained in "Instructions for conducting an enquiry into cholera in India," especially with reference to "Section iv., movement of cholera."

SECTION IV.
Results of analysis of water from a well, near Canteen, 76th Regiment, at Thayetmyo.

SECTION V.
Map of the cantonment of Thayetmyo.

SECTION I.

Enquiries made of residents in Coolie lines, regarding the Cholera Epidemic in April 1869.

THE Assistant Thugee, or head man of the village, gave the following replies to queries put to him by me on 21st June, 1869 :—

Question 1.—When did you first become aware of Cholera in Coolie lines, and on what date was the first case observed ?

Answer.—Fifteen days before the Totie's death, which occurred on 25th April, as far as I can recollect.

Cannot say exactly the date. The first case was a bandyman, a Burman, he died three days after he was attacked.

Second case, a Coolie in Public Works Department, attacked at 10 A.M., died at 8 P.M. of same day.

Third case, a bandyman, Moosalman, taken ill one night, died the next.

Fourth case, a Burman child, died within 24 hours.

Fifth case, a Burman girl about five years old, died within 24 hours.

Sixth case, a Burman bandyman, taken ill, and died within one hour.

Cannot give the dates of the above cases, nor am I sure that I have stated them in the order in which they occurred.

Question 2. What made you believe it to be cholera ?

Answer.—The symptoms.

Question 3.—Did they get any medicines ?

Answer.—Native remedies.

Question 4.—Why did you not immediately report the existence of cholera to the Assistant Commissioner or Civil Surgeon.

Answer.—Got no instructions to make any report of sickness at that time. Has since received orders to do so.

Question 5.—Who is the head man in the Coolie village ?

Answer.—A Burman.

Question 6.—Are you under no cantonment laws or supervision ?

Answer.—None.

Question 7.—If any resident (not a regimental or public follower) got ill of any ordinary disease, to whom did he apply for aid ?

Answer.—They treated themselves with native remedies, sometimes they applied to a Madrassee barber, or village doctor, but he has died of cholera, so now they have nobody.

Question 8.—How many cases of cholera do you think have occurred in your village on the present occasion ?

Answer.—I think about 16 or 17 cases, but am not sure.

Question 9.—Of these cases how many died ?

Answer.—I think about 12 died.

Question 10.—Of the fatal cases, how many were men, how many women, and how many children?

Answer.—I think 7 men, 2 women, and 3 children died.

Question 11.—What was done with their bodies?

Answer.—All buried.

Question 12.—Where were they buried?

Answer.—Close to the village.

Question 13.—Have you no distant burial ground fixed by law?

Answer.—None.

Question 14.—What was done with the soiled clothes and bedding of those who died from cholera?

Answer.—They were thrown out in the neighbouring jungle and left there, and some were thrown out by the graves. Nothing was done with them until Dr. McAllum (Civil Surgeon) and yourself had some soiled bedding buried, which you found at the burial place the day you came there.

Question 15.—What was done with the cholera stools and vomit? If received in vessels or chatties what was done with them? If the sick person relieved himself on the floor of his hut, what was done?

Answer.—They were generally just swept away, sometimes covered with sand. No vessels or chatties were used.

Question 16.—Were cramps severe in the several cases?

Answer.—Some had cramps, others none.

Question 17.—Was suppression of urine observed?

Answer.—Does not know.

Question 18.—Did any die after getting warm and all vomiting and purging had ceased?

Answer.—Thinks all died in cold stage.

Question 19.—Did the other people in the village suffer from diarrhœa at this time?

Answer.—Many were afraid and were suffering from diarrhœa. Two or three ran away and crossed the river from fright. One came back a day or two after to the village, and died of cholera. The others returned lately, and are well.

Question 20.—Have you got privies in your compounds?

Answer.—No. Go to the jungle, or nullah close to the village, or to the river bank, to relieve nature.

Question 21.—Whence do you get your drinking water?

Answer.—We have no wells; some dig holes in the sandy bed of a branch of the river close at hand: some go to a well in the Lascars' lines: others subscribe and get a bandy and water cask, and send to the river.

Question 22.—Were any of the residents in Coolie village employed in April this year in bricking the ground floor of the 76th married barracks?

Answer.—No; the Coolies and work-people employed on the married barracks came from a Burmee village, and not from the Coolie village.

Question 23.—How many years have you lived in Coolie village?

Answer.—Twelve years.

Question 24.—How often has cholera visited the village during that time?

Answer.—Three times, including the outbreak in April this year (1869).

Question 25.—In what years did the first and second outbreaks of cholera take place?

Answer.—First in 1857, second in 1862.

Question 26.—In what months of the year did the first and second outbreaks you mention occur?

Answer.—They each occurred later in the year than the one this year in April, but I do not recollect the exact months.

Question 27.—To what do you usually attribute the appearance of the disease?

Answer.—To nothing particular, I consider it "Fate."

Question 28.—Did you attribute the appearance of cholera this year to any particular cause?

Answer.—No; the village people and Poonghees (Priests) say it arose from the great heat of the weather producing fermentation of the blood.

Question 29.—Do you think any one coming from some other place could have brought the disease to your village this year?

Answer.—No, I do not think so.

Question 30.—Do you take any measures to drive away the cholera?

Answer.—Yes, we tap or beat the posts of our houses with a piece of wood.

Question 31.—Have you any medicines good for it?

Answer.—None.

Question 32.—Do you think it is contagious?

Answer.—The Burmese think so; they leave a house infected with cholera, and never return to it.

Question 33.—Do you think that eating bad food, or drinking foul water, would give cholera?

Answer.—The Burmese think so.

Question 34.—Was there any cholera in the neighbourhood of the Coolie village in April last?

Answer.—I heard of none.

NOTE.—The individual from whom the above information was obtained, is a native of India. It will be observed that in replying to certain questions, he quotes the opinions of the Burmese, but avoids giving his own ideas on the subject.

When cholera appeared in the native town of Thayetmyo, the Burmese fired guns, rockets, and such like, and beat gongs and tom-toms, and made all sorts of horrible noises to frighten away the demon god, who was supposed to have something to do with the prevailing epidemic.

With regard to native remedies, I may mention that when visiting the Coolie village along with the Civil Surgeon, in April 1869, during the prevalence of cholera, I saw a Burman administering medicine to his wife, who was in the second stage of the disease.

On examination, the medicine proved to be simply a solution of common salt in water, of which he gave her a mouthful occasionally out of a tumbler.

I believe the woman eventually recovered. Whether her recovery was attributed by her friends to the saline treatment or not I cannot say.

I could not find out where the Burman got the idea of the salt and water.

The following replies were made by the Regimental Kotwal, who resides in the Coolie village, to certain questions put to him:—

Question 1.—How many followers belonging to 76th Regiment live in the Coolie village, including yourself?

Answer.—Thirty-one.

Question 2.—Enumerate them?

Answer.—1 khotwal, 10 cooks, 8 bheesties, 8 sweepers, 4 toties. (1 toty died, and another came in his place).

Question 3.—A toty died of cholera on 25th April, can you give me any account of his case?

Answer.—None.

Question 4.—When did you first become aware of cholera in Coolie village?

Answer.—Six days before the toty died.

Question 5.—On what date did the first case occur?

Answer.—I don't know.

Question 6.—What made you believe the disease was cholera?

Answer.—The people all called it so.

NOTE.—The other questions and replies are similar to those recorded in connection with the examination of the Assistant Thugee, and as they elicit no new facts, need not be repeated.

I have ascertained from the Medical Officer in charge of Royal Artillery at this station, that in April 1869 there were 5 native followers of the battery residing in the Coolie village, viz., 3 toties, 1 horsekeeper, 1 grasscutter.

I am happy to state, that since writing the remarks on the state of the Coolie village in the body of the preceding Report, active measures have been taken by the Civil authorities towards the removal of the said village altogether.

SECTION II.

COPY of a Letter addressed to the Assistant Commissioner of Thayetmyo, seeking Information regarding the Origin and Progress of Cholera in the Town and District; also a copy of his Reply, which latter is frequently alluded to in the preceding Report.

No. 128.

From Senior Medical Officer, British Medical Service, Thayetmyo, to Assistant Commissioner, Thayetmyo, dated 23rd September, 1869.

Sir,

Having been called upon by the Inspector-General of Hospitals, Her Majesty's British Medical Service, Madras, to report, for the information of Government, on the recent outbreaks of epidemic cholera amongst the European troops at this station, and in connection therewith to give full particulars as to the existence and progress of the disease among the Native population, not only in the immediate vicinity of Thayetmyo Cantonment, but also in the surrounding country, I have the honour to request that you will favour me, at your early convenience, with brief replies to the following queries, viz. :—

I. The first appearance of cholera in the neighbourhood of Thayetmyo this year, so far as I can ascertain, appears to have been in the Coolie village just outside the northern limit of the military cantonment, in the month of April.

(*a*) Do you know on what date the first case occurred in Coolie village?

(*b*) Was the disease supposed to have originated in Coolie village, or to have been imported from any other locality at the time believed to be infected?

(*c*) How many persons (adults and children) in all, were attacked with cholera this year in Coolie village?

(*d*) How many died?

(*e*) On what date was the last case reported in Coolie village?

(*f*) Has the Coolie village been visited by cholera annually, or at irregular periods, during the last five or six years?

(*g*) Have its residents been subject periodically to severe attacks of fever, dysentery, or diarrhœa?

(*h*) What was the population of Coolie village at the commencement of the outbreak in April 1869?

(*i*) What has been the average population of the village for the last five or six years?

II. On the 7th August, 1869, you reported to the Brigade the death of a Burman which had occurred in the Native town of Thayetmyo on the previous night, and which was supposed to have been the result of cholera; further, that the individual had only arrived from Prome a few hours before his death, and had been ill for two or three days.

(*a*) On what grounds was the man alluded to supposed to have died of cholera?

(*b*) Was cholera at that time (beginning of August) existing at Prome, or at any other town or village, on either side of the river Irawaddy, between Prome and Thayetmyo, at which the deceased might have called on his way up?

(*c*) Was deceased an inhabitant of Prome, or of Thayetmyo?

III. On the 8th August, 1869, three cases of cholera were reported in the Native town of Thayetmyo by the Civil Surgeon.

(*a*) Do you know if either of those individuals had been in communication with the Burman who died on the evening of 6th August, or with any of his friends or party?

(*b*) Did cholera break out on 8th August in or near the part of the town where the aforesaid Burman from Prome died on 6th August?

(*c*) Was this outbreak on 8th August the first intimation of the existence of cholera in the Native town of Thayetmyo this year, or are any cases supposed to have occurred before that date?

(*d*) The disease appears to have lasted in the Native town from 8th August to 5th September: did it confine itself to one locality, or was it erratic in its course?

(*e*) Since the disappearance of cholera from the town on 5th September (date of last case), has it broken out in any other part of the district?

(*f*) If so, please mention the place, with its direction and distance from Thayetmyo, and if there is regular communication between the two places?

IV. Has cholera occurred this season in any other towns or villages in the Prome district prior to, or since, 8th August?

(*a*) If so, please state the name of each place, with its direction and distance from Thayetmyo.

(*b*) Also the date on which it appeared in each place respectively, and if frequent intercourse was, and is, kept up between each locality and Thayetmyo.

(*c*) Also the number of cases and number of deaths in each place.

V. Are you aware if cholera has existed this year in any of the towns beyond the frontier, on either bank of the river Irawaddy, or in the interior, excluding Mandalay?

(*a*) If so, please state the name of each place, with its direction and distance from Thayetmyo.

VI. It has been currently reported that cholera has raged for some time back in the city of Mandalay, and has not yet entirely abated.

(*a*) Is this report correct?

(*b*) If so, do you know about what date cholera first appeared this year in Mandalay?

(*c*) Have you any means of ascertaining whether the disease originated in Mandalay, or was believed to have been imported? If the latter, from whence?

(*d*) Can you state if Mandalay is subject to annual visitations of cholera?

(*e*) Considering the constant communication, by steamers and Native boats, between Thayetmyo and Mandalay, in connection with the doctrine much believed in now-a-days, that cholera is transmissible by such means, are any measures of precaution adopted by the civil authorities at Thayetmyo, when cholera is known to prevail at Mandalay or any of the towns on the river bank such as enquiry into the health of passengers and crews arriving from those places, inspection of the sanitary condition of vessels, and such like?

(*f*) Can you inform me if any cases of cholera have been reported this year, as having occurred on board of any vessels trading between Rangoon and Thayetmyo and Mandalay?

(*g*) If so, please give the dates and places of their occurrence, and whether fatal or otherwise.

VII. From your experience of this district and station, do you think that the present year has been exceptional as regards climate—viz., temperature and rainfall—and have you observed whether the Natives have been on the whole more subject to disease this year than usual?

I have, &c.

W. A. THOMSON, M.B., *Surgeon, 76th Regt., Senior Medical Officer, British Medical Service.*

The Assistant Commissioner's reply to the foregoing letter is as follows:—

No. 363.

Home Department.—Sanitary.

To Dr. Thomson, Senior Medical Officer, British Medical Service, Thayetmyo, dated Thayetmyo, 12th October, 1869.

Sir,

I have the honour to submit replies as follows to the queries in your letter, No. 128, of 23rd September, 1869:—

I. (*a*) On 14th April.

(*b*) Supposed to have originated in the Coolie lines.

(*c*) Twelve persons in all.

(*d*) Nine died.
(*e*) 1st May.
(*f*) Has not been visited with cholera during the last five years.
(*g*) No, as far as can be ascertained.
(*h*) 295.
(*i*) About 325; but this average cannot be depended on, as till this year the population of the Coolie lines had been included with Theegong village which is about 100 yards distant.

II. (*a*) Because he died from purging, vomiting, and spasms, and it was reported as cholera at the time of his death.
(*b*) Cholera was reported here to be at Prome, but as that is not within my jurisdiction I am unable to speak positively; but there was none at that time in the villages on the river bank within my jurisdiction.
The deceased's brother stated that deceased was attacked after leaving Prome, and was ill in the boat for two or three days on the way up.
(*c*) An inhabitant of Thayetmyo.

III. (*a*) It is believed not, but cannot be positively ascertained.
(*b*) No; in different parts of the town, and at places considerably apart.
(*c*) The first intimation of cholera in the town was when the man who came up from Prome died on 6th August; previous to that there had been no cholera in the town during the past year.
(*d*) Did not confine itself to one locality, but was erratic through the town.
(*e*) No.
(*f*) Last answer replies to this question.

IV. Yes.

(*a*) Thabyee Ban village, 18 miles east of Thayetmyo.

Yayay	„	14 „	„	„
Oshilkong	„	21 „	„	„
Thonynazine	„	40 „	„	„
Thitnyo	„	38 „	„	„
Letpangon	„	28 „	„	„
Iswaydon	„	30 „	„	„

Very little intercourse between these localities and Thayetmyo. They lie on the east side of the river.

(*b*) Thabyee Ban on 10th July, terminated on 9th August.

Yayay	„ 11th	„	„	14th July.
Oshilkong	„ 10th	„	„	23rd „
Thonynazine	„ 23rd	„	„	6th August.
Thitnyo	„ 9th	„	„	28th July.
Letpangon	„ 9th	„	„	3rd August.
Iswaydon	„ 10th	„	„	15th July.

			Cases.	Deaths.
(*c*) Thabyee Ban village	....	....	24	20
Yayay „	....	....	7	4
Oshilkong „	....	....	8	8
Thonynazine „	....	....	2	2
Thitnyo „	....	....	15	10
Letpangon „	....	....	9	9
Iswaydon „	....	....	7	6

V. Yes; it is stated to have existed at Pokokkoo, Nyen-Gyan, and Myan-Tha villages.
(*a*) Pokokkoo, about 100 miles north-west of Thayetmyo.
Nyen-Gyan, about 150 miles north-east of Thayetmyo.
Myan-Tha, about 100 miles north-west of Thayetmyo.

VI. (*a*) Believed to be correct, but cannot speak positively.
(*b*) No.
(*c*) Cannot say.
(*d*) Cannot say.
(*e* and *f*) No; I have never heard of any cholera in the boats coming down, which I should do if there was cholera, as they stop here for their Custom-house pass.

I only heard of one case on a Burmese steamer going to Rangoon. The patient received medical aid from the Civil Surgeon while the steamer remained, and I believe recovered.

(*g*) I am unable to give the date of the only case I heard of; it was a considerable time ago.

VII. Yes; there has been much less rain than usual; the weather has been unusually hot, and there has been, I think, more sickness than usual this year.

I have, &c.
W. Munro, *Assistant Commissioner.*

A true copy.
W. A. Thomson, M.B., *Surgeon, 76th Regt.*

Section III.

A copy of the printed "Instructions for conducting an Enquiry into Cholera in India" was forwarded to me officially while engaged in writing the foregoing Report, and my attention was particularly directed, with especial reference to the epidemic at Thayetmyo, to Section *IV.*, page 5, "Movement of Cholera."

I shall now, therefore, endeavour to reply to some of the chief questions contained in the said section.

Premonitions of cholera.

1. There were no indications of an altered state of health among the unaffected inhabitants of Thayetmyo, whether European or Native, when cholera was supposed to be approaching the station this year (1869), so far as I could ascertain.

2. Diarrhœal affections and fevers were unusually prevalent in the wing 76th Regiment at the periods cholera visited the regiment—viz., in May, July, August, and September 1869—but not prior to those dates, or *i.e.*, when cholera may be supposed to have been approaching.

In May especially, the children of the corps suffered unusually from digestive and febrile affections.

The attacks of acute (non-choleraic) diarrhœa, accompanied by fever and cerebral disturbance, among children were sudden and alarming, and in some instances rapidly fatal.

Adults suffered to a less degree. The Royal Artillery had no unusual amount of sickness at this period, neither had the Native troops nor the Native inhabitants, so far as I can learn.

3. There are other premonitions of cholera sometimes, but not always observable—viz., intense heat and feeling of oppressiveness in the atmosphere, with absence of usual rainfall.

Enquiry regarding the forms of cholera.

These phenomena were observed when cholera attacked the cantonment this year.

Cholera presents itself under three forms, viz.:—

1. Sporadic.
2. Endemic.
3. Epidemic.

4. I believe them to be precisely similar.

5. Premonitory symptoms, as a rule, prevail among unaffected persons in localities where endemic and epidemic cholera occur, but not usually where sporadic cases are chiefly met with.

6. Theoretically there are many appreciable phenomena in the disease, in the locality, in the habits of the people, or in the nature of the seasons and atmospheric conditions, which might naturally be supposed to account for the existence of one form of cholera rather than another, or for the passage of one form into another.

Practically, however, it is often found that phenomena which are supposed to be most favourable to the production of cholera, such as crowded cities or villages, intense heat, partial rainfall, impure water, accumulations of filth, and absence of everything in the shape of sanitary arrangements, may exist, and the persons subjected to such evil influences yet enjoy a wonderful im-

munity from endemic or epidemic cholera. Sporadic cases may occur amongst them, and no more.

Again, how often it is seen in a severe epidemic of cholera, that the disease first selects what appears to be the healthiest and best-regulated locality for its attack, passing over, for a time, spots reeking with filth. Sometimes even these unwholesome spots are left intact altogether.

I have always observed, however, that when the disease did eventually settle down on filthy bazaars and such like, its ravages were very severe, and its effects rapid and sweeping.

7. I might adduce theories to show why a sporadic case of cholera is not followed by other cases, but at present I cannot give facts to support such theories.

8. The same answer applies to the question, why an endemic outbreak does not become epidemic?

9. Influence of sex and age. This question refers to persons living in a circumscribed endemic locality. Thayetmyo is not considered an endemic locality, as hitherto, I believe, it has been subject only to epidemic visitations at irregular intervals. Question of susceptibility.

The following statistics, therefore, are not given in answer to the question, but simply as matters of fact which bear indirectly on the subject, and are of some interest, viz.:—

The Head-Quarters' Wing of Her Majesty's 76th Regiment suffered from cholera more or less from May to September 1869.

Average strength during that period:—

Officers	10
Men	344
Women	40
Children	46
Total	440

Of that number there were attacked with cholera, and died of the same, during that period:—

	Attacked.	Died.
Men	12	4
Women	5	3
Children	6	6
Total	23	13

NOTE.—Of the 6 children, 5 were females.

PERCENTAGE of each Sex and Age Attacked and Died.

Men.

Attacked .... 3·48 per cent. of strength of 344.
Died .... 1·16 „ „ „
Percentage of died to attacked, 33·33.

Women.

Attacked .... 12·50 per cent. of strength of 40.
Died .... 7·50 „ „ „
Percentage of died to attacked, 60.

Children.

Males attacked .... 4·76 per cent. of strength of 21.
„ died .... 4·76 „ „ „
Females attacked .... 20 „ „ 25.
„ died .... 20 „ „ „

All Children;

Attacked .... 13·04 per cent. of strength of 46.
Died .... 13·04 „ „ „
Percentage of died to attacked, 100.

Percentage of Attacked and Died of Officers, Men, Women, and Children.

Attacked .... 5·22 per cent. to total strength of 440.
Died .... 2·95 „ „ „
Percentage of died to attacked, 56·52.

The Native town of Thayetmyo suffered from cholera from 8th August to 5th September, 1869.

Population of Native Town on 1st August, 1869, total 9,000, viz.:—

Men	2,672
Women	2,795
Children, male	1,799
„ female	1,734
Total	9,000

Of this number there were attaeked and died of cholera the following:—

	Attacked.	Died.
Men	12	8
Women	14	9
Children	21	17
Total	47	34

Note.—Of the 21 children attacked, 9 were males and 12 were females,

Native Town.—Percentage of each Sex and Age Attacked and Died.

Men.

Attacked .... ·45 per cent. in population of 2,672.
Died .... ·29 „ „ „
Percentage of died to attacked, 66·66.

Women.

Attacked .... ·50 per cent. in population of 2,795.
Died .... ·32 „ „ „
Percentage of died to attacked, 64·28.

Male Children.

Attacked .... ·50 per cent. in population of 1,794.

Female Children.

Attacked .... ·68 per cent. in population of 1,734.

Male and Female Children.

Died .... ·48 per cent. in population of 3,533.

Percentage of Attacked and Died in Population of 9,000 Men, Women, and Children.

Attacked .... ·52 per cent. in population of 9,000 Natives.
Died .... ·37 „ „ „
Percentage of died to attacked, 72·34.

10. I should fancy persons of nervous temperament were more susceptible than others, but I cannot speak with confidence on this subject. Influence of temperament

11. Poorly-fed and badly-nourished persons, one would imagine more susceptible to cholera than those whose food is good and abundant. Influence of diet.

12. Persons in delicate health and of weak habit of body, are frequently attacked by cholera when it exists in a place, as, for instance, patients in hospital suffering from depressing diseases, such as fevers, secondary syphilis, &c. Influence of health and habit of body.

I have met with two marked instances of men suffering from constitutional syphilis (patients in hospital) being attacked with cholera when the disease was epidemic. One suffered from rupia, the other from cranial nodes: both died.

At the same time strong healthy men are often cut down, but I think as a rule they are not so susceptible as the weakly ones.

13. I cannot say. Influence of race.

14. I cannot say.

15. It might be shown by statistics whether mehters employed in collecting and removing excreta, during times when cholera prevails, suffer more from cholera, or only to the same extent as others living in similar localities. Influence of occupation.

I have no data on the subject. In my own small experience I cannot recollect a single instance of a mehter being attacked when specially employed to remove the excreta of cholera patients.

16. Occupations involving much fatigue and long marches are more or less conducive to an attack of cholera, when that disease prevails in a locality, for the reason that such occupations tend to depress the system.

17. I have not observed that the moderate use of spirituous liquors has any apparent influence on susceptibility to cholera. Influence of intemperance.

18. I have seen the man of regular, temperate, even abstemious habits of life, knocked over with cholera quite as often as the intemperate.

But I consider that, as a rule, the temperate man, when attacked, has a better chance of recovery than the intemperate, as the constitution of the latter is generally more or less impaired, and therefore worse fitted to withstand the shock of so serious a disease.

The statistical Table given by Inspector-General Beatson, C.B., in his valuable Report on Cholera in Bengal in 1867, I think proves what I have just said—namely, that the mortality amongst intemperate men attacked exceeded the mortality amongst the temperate.

In this Table we find that the "ratio per cent. of temperate died to "attacked, was 64·05," while that of intemperate was "83·72."

Without questioning for a moment the accuracy of the above statistics, as I have not the least doubt they are founded on most reliable data, yet I cannot forbear to offer a remark on the frequent fallaciousness of the terms "temperate" and "intemperate," as used in the Army. A man frequently bears the regimental character of "temperate" while his medical history sheet shows admissions from delirium tremens, ebriositas, and dyspepsia; and he is finally invalided on account of his constitution being destroyed by intemperance. He has, in fact, been a "soaker" for years, but has never once been found drunk.

Again, many a man who in the regimental records is returned as "intemperate," has never perhaps been in hospital from any disease resulting from excess, but is an individual who, after long periods of sobriety, goes in for a bout of drinking, and as a matter of course is found out and punished.

19. I believe that the influence of aggregations of persons, both as regards (*a*) actual numbers and (*b*) crowding on a given area, on susceptibility to cholera, can in numerous instances be statistically proved. Influence of the element of number.

20. Many facts are recorded by reliable authorities which go to prove that cholera is occasionally communicated, directly or indirectly, from person to person. Communicability of cholera.

29. In my Report I have endeavoured to trace the origin of the outbreak of epidemic cholera, in the wing of 76th Regiment at Thayetmyo in May 1869, to communication with the Coolie village, in which the disease first appeared in the month of April, from the fact that most of the Native followers, daily Sources of evidence.

Evidence from observations of epidemic cholera.

employed in the barracks, resided in the village, and that one of them, a toty, died of cholera on 24th April.

At the same time I have shown that there was constant daily communication between the Coolie village and the Artillery horsekeepers' lines; and furthermore, that some of the Native followers attached to A Battery 23rd Brigade Royal Artillery, and employed daily in the Artillery Barracks, actually resided in the Coolie village at the time, and that thus the horsekeepers and the Artillery must have been exposed to the same risk of cholera by communication as the 76th; yet, from first to last, not a single case occurred either among the men, women, aed children of the battery, or among the Native horsekeepers and their families.

With regard to the outbreak in the Native town of Thayetmyo, and the existence of the disease in the country round, I have, in the Report alluded to, given all the information I have been able to procure, and I regret it is so imperfect.

The outbreak in the town would appear to be closely associated with the arrival of the man from Prome on the 6th August, and his death by cholera on the same night.

Whether the disease existed in the town prior to that case or not, I cannot say. The civil authorities think it did not.

One, therefore, might at first sight be justified in saying that the disease was introduced into the town by the man from Prome; but considering the constant daily communication which must have taken place between the town and the barracks, and the frequent arrivals of Natives from other infected places in the district besides Prome, and whose movements were never recorded and are consequently unknown, I think it is impossible to make any confident assertion as to how the disease was imported.

The case from Prome is a remarkable coincidence, but I think nothing more. The point, however, is open to question.

Communicability from person to person.

On the subject of communicability of cholera from person to person, I would make the following observations:—

1. In the "Proceedings of the International Sanitary Conference," from pages 77 to 88, some important evidence on the subject is given.

2. In my Report on the epidemic of cholera in 76th Regiment, I have particularly drawn attention to the case of the child McAlister, and also to the ayah who attended on Mrs. Comerford.

The circumstances connected with those cases lead me to consider that, in each instance, the disease was contracted by direct communication.

3. A few years ago, during an epidemic of cholera in Bengal, I met with an instance of what I believe to have been the direct communication of cholera from a patient to his medical attendant.

The circumstances were the following, and I can vouch for the accuracy of the facts:—

On a Saturday night a Medical Officer had occasion to visit a cholera ward, accompanied by three brother Officers and an Apothecary. He found one man in a very low state, and ascertaining that no urine had been passed for some hours, at once introduced a catheter. About 6 or 8 ounces of fluid were drawn off, of a turbid rice-water character, exactly similar to the discharges coming from the bowels, and very offensive. The odour was so horrible that the Medical Officers looking on said they felt inclined to vomit. The operator at the time remarked that he had got such a whiff that he thought he had regularly inhaled it. Next day (Sunday) he felt unwell, suffered in fact from malaise, but did not lay up, as there was too much work to be done. On the Monday morning early, severe diarrhœa came on, and at 11 A.M. rice-water stools, cramps, and other symptoms of cholera. He eventually recovered.

It is possible that the officer in question may have been more susceptible to the epidemic influence at that particular time, as he was fatigued, both bodily and mentally, from the trying nature of his duties; but nevertheless I look upon the case as one of direct communication.

One of the other Medical Officers who was present on the occasion just referred to, suffered for three or four days afterwards from marked malaise, but nothing more. He attributed his symptoms to the same cause which in the case of his friend induced an attack of cholera.

It is strange, however, to reflect how many Medical Officers and subordinates, not to mention Native servants, go through repeated epidemics of cholera, with all the attendant fatigue and exposure, without suffering from the disease at all.

31. The movements of the population in this part of Burmah are effected chiefly by walking, and by river steamers and Native boats. Means of communication to be described.

To questions 51, 52, 53, I cannot at present reply.

54. I have reason to believe that the disease is mitigated by improved diet and regimen among troops and prisoners, when those items have been defective. Enquiry into causes why epidemics cease.

55. Although cholera will and does attack places which to all appearances are free from sanitary defects, yet I think it could be shown by reference to records of epidemics at different stations, that places where sanitation had been neglected in all material points, as a rule suffer more than those which are better regulated.

Again, I believe it could be proved that cities or cantonments once notoriously insanitary, but after a time greatly improved by proper drainage, good conservancy, and pure water supply, have suffered much less during subsequent visitations of cholera than they did prior to the sanitary improvements being effected.

56. The good results of removing troops and families from infected barracks, and encamping them on clean ground, were apparent in the case of the 76th Regiment at Thayetmyo in 1869, and have been frequently, I may say of late almost yearly, witnessed in different parts of India.

Section IV.

In Section IV. will be found an analysis by the Chemical Examiner, Madras, of the water of the well near 76th Canteen, Thayetmyo, referred to in the body of the Report.

Results of Analysis of Drinking Water received from Inspector-General, British Medical Service. Well near Canteen, Thayetmyo.

Sensible Properties.

Appearance	Clear.
Taste	Agreeable.
Odour	None.

Chemical Properties.

To test paper reaction		Alkaline.
Solid matter in 1 imperial gallon	Organic and other volatile matter	4 grs.
	Inorganic, salts, &c.	50 „
	Total	54 „
Oxidizable matter by permanganate solution, relation of oxygen to organic matter 1 to 8		·3360
Hardness to soap test, −1° = ·727 grains of carbonate of lime, and ·989 of sulphate of lime	Temporary	17°·5
	Permanent	2°·5
	Total	20°·0
Chlorides determined volumetrically as chloride of sodium, in 1 gallon		6·547
Carbonate of lime		Much above average.
„ magnesia		Above average.
Iron		None.

In solution after boiling :—

Lime	Scarcely any.
Magnesia	None.
Chlorides	Not excessive.
Sulphates	Above average.
Nitrates	Present.
Ammonia	None.
Nitrites	Ditto.

HENRY KING,
Acting Chemical Examiner.

Examiner's Office,
Madras, October 14, 1869.

REMARKS.

This is a very *hard* water, but does not appear to be otherwise objectionable. The presence of nitrates seems to show some slight sewage contamination, but the nitrogen has probably been completely oxidized, and I do not consider the water unfit for use.

Chemistry does not profess to detect cholera germs.

H. K.

A true copy.
W. A. THOMSON, M.B.,
Surgeon, 76th Regiment.

SECTION V.

In Section V. is a map of the cantonment of Thayetmyo, *showing the* situation of the "Coolie village," where the first outbreak of cholera occurred in April 1869, and also the relative positions of the various buildings occupied by 76th Regiment, in which the disease appeared during the year.

The following letters on the map indicate the *localities* :—

A Coolie lines or village.
B Shye Bustee.
C Nullah ; dry, except in monsoon.
D No. 10 Family Barrack, where cholera first appeared in 76th Regiment on 9th May, 1869.
E Detached bungalow, in which child McAlister was attacked on 11th May, 1869.
F No. 11 Family Barrack, where cases occurred on 11th May, 1869.
G No. 12 Family Barrack, in which Private Arthur was attacked on 29th May, 1869.
H Space of ground in redoubt, where families of 76th were first encamped.
I Brigade-ground, where second and subsequent camps, including preliminary camp, were pitched.
K Barrack used as 76th hospital, in which cholera appeared on 30th July, 1869.
L Ground on which tents were pitched for treatment of cholera cases.
M Barrack occupied by sick, when hospital was evacuated on 5th August.
N Band Barrack, whence Private Springett was admitted.
O No. 8 Company Barrack, whence Private Allum was admitted.
P Road to Native town of Thayetmyo.
Q Staff-Serjeant's Quarters, 76th Regiment, where cholera appeared on 2nd September, 1869.

W. A. THOMSON, M.B.,
Surgeon, 76th Regiment.

PLAN OF CANTONMENT THAYETMYO.

APPENDIX, No. XIV.

SOME OBSERVATIONS ON OPHTHALMIA AS IT APPEARED IN THE 1ST BATTALION 22ND REGIMENT FROM 1860 TO 1870.

By A. LEITH ADAMS, M.B., Surgeon-Major 22nd Regiment.

PRELIMINARY REMARKS.

THE observations here recorded refer particularly to what has been designated *Chronic, Granular, Vesicular,* and by some *Military Ophthalmia.* The last appellation is clearly a misnomer, seeing that a disease absolutely identical is quite as prevalent, if not more so, among the lower classes of crowded cities; perhaps it may be from individual observers not enjoying opportunities of studying the disease beyond a certain contracted area, and thus from only one stand-point, that all these various names have been given to what is doubtless one specific morbid condition.

Again, the diagnosis between any two forms of ophthalmia is often difficult in the extreme, seeing that the various sorts appear to often run into each other; thus it might be that we have fallen into the error of claiming special names for what are modified or aggravated phases or descriptions of one disease. Whatever may be the proper view of the subject, it is clear that no very accurate notion can be obtained until especial attention has been directed to their etiologies and premonitory symptoms, in as much as, by waiting until the inflammatory action is fully developed, and studying the disease from the date of the patient's first application for relief, we are most assuredly only examining the main branches whilst the fountain-head and tributaries remain unexplored.

In this way (of necessity) is the civil practitioner placed with perhaps fully nine-tenths of his patients, whilst the Army Surgeon, from having them constantly under observation, is enabled to follow up the disease from first to last, and is therefore in the best position to work out details and make up his mind with reference to its causation, or in plain words to stamp out ophthalmia when it has once taken root and become endemic among soldiers. Looking at the statistics of the Army, it will be apparent that one of the chief causes of invaliding and inefficiency is ophthalmia, whilst the pertinacity wherewith the disease adheres to regiments for years sufficiently attests the importance of a close acquaintance with its natural history and therapeutics, or indeed of whatever measures are likely to eventuate in putting a stop to a condition which has hitherto marred the efficiency of the soldier, and not unfrequently defied the exertions of his medical attendant.

As regards Malta, there are few military stations more infected by ophthalmia; it is always present among the lower classes, and seldom regiments pass their time in the islands without becoming more or less tainted; indeed there is no element hitherto ascribed either favourable towards its production, or propagation, that does not exist there to the fullest extent; so marked is this that a corps is considered fortunate indeed should it escape after three years' residence in their badly-constructed barracks.*

* With the exception of the new Military Barrack at Burmola and St. George's Bay, the latter constructed during the enlightened government of Sir J. Gaspard Le Marchant, all the other quarters are merely old storehouses and casemated buildings that belonged to the Knights of St. John of Jerusalem, and had been transmuted into military quarters. Had proper building been constructed at first, how much would the country have saved in the way of invaliding men for ophthalmia alone; not to speak of the loss of life from plague, cholera, typhoid fever, &c., displayed by the medical histories of Floriana, Lower St. Elmo, and other barracks?

At the same time it must be remarked wherever exceptions to the above course of events have occurred, that such (rare as they have been) will be found to owe their immunities to having been quartered in the more healthy barracks; but in justice to the Medical and Military Officers of such favoured regiments, I must state that on careful inquiry into the health of their corps, as preserved in the archives of the Inspector-General of Hospitals at Malta, it was apparent to me that if the men were lucky as to quarters, they had likewise cause to congratulate themselves on the efficiency of their Commanding and Medical Officers.

History of the Epidemic.

The following remarks are the decisions of 10 years' observation among a body of soldiers whose previous medical histories were well known to me; indeed, from over a score of years' service in one battalion, both in temperate and tropical regions, I had no difficulty whatever in noting individual conditions, therefore I feel confident at the onset in stating, as far as the medical history of the 1st Battalion 22nd Regiment is concerned, that there was for many years a marked immunity in its ranks from ophthalmic disorders in general, and the said granular form in particular, and until the corps left for the Mediterranean in the year 1860.

On referring to the health statistics of the regiment for nearly 20 years preceding, I can find no relevant allusion whatever to granular or any other form of ophthalmia having existed in its ranks, either epidemically or endemically. Thus a healthy body of 838 men, and their complement of 77 wives and 82 children, sailed for Malta, June 1860, and before the termination of the year there occurred among the men no less than 40 admissions from conjunctivitis; but all the cases were *mild*, and yielded readily to the usual plans of treatment.

The majority of the cases were attacked in August and the following month, when the moist sirocco or south-east wind prevails in its greatest intensity, when man and beast have just passed through the trying heats of summer. That is the season moreover, when conjunctival inflammations are epidemic among the civilians, as will be noticed in the sequel.

The important features observed in these 40 cases were—1st. That the disease was mild, and might have fairly been called simple conjunctivitis, such as might have been induced by high temperature, solar radiation, or intrusion of fine particles of sand or dust. 2nd. The number of admissions rapidly decreasing during the cold months seemed to confirm this opinion, so far (at all events), that on the reappearance of the hot months of 1861, the same rapid increase of cases took place, and the type as before was also a tractable conjunctivitis. This year furnished 33 admissions, 11 of which were relapses of the former year; but there was no apparent distinction to be made out between the cases, which occurred in the greatest amount in August and September. During 1862, upwards of 17 cases were admitted into hospital,* among these a very few were followed by persistent thickening of the palpebral conjunctiva, which brought on relapses when the eye was exposed to strong sunlight or cold north winds in winter.

It was during the summer of 1863 that granular ophthalmia became fairly established in the corps. Now it seemed as if the simple manageable form of the three previous years had steadily given place to a chronic and very obstinate type; no less than 35 admissions took place, of which 4 were relapses in persons previously attacked. To be brief, the weekly average will best explain the state of the sick list from 1862 to 1870. The average for 1862 was 0·23, that for 1863 0·92, rising to 1·66 in 1864, to 5·42 in 1865, to 8·18 in 1866, when the regiment left for Canada, where, from relapses induced by exciting causes to be observed hereafter, there was a weekly average in 1867 of 4·0, and in 1868 of 4·01. Lastly, the return of the corps to England in 1869, reduced the figure to 2·37, and for this year (1870) it stands (December), *nil*, the disease having at length become extinct.

* It must be understood, in stating the numbers affected, that the "admissions" represent relapses and not the actual number of men subject to the disease, *i.e.*, one man may form often four or more admissions.

The broad conclusions from what has just been furnished show that a mild tractable form of disease, with very few chronic cases and relapses, existed during the first three to four years: moreover the same seemed to be the course of events in other regiments which had served for more lengthened periods in the islands; but gradually the cases became more and more chronic, eventuating in granular ophthalmia.

Thus it seemed, in order to fairly establish a proclivity towards granular ophthalmia in a body of soldiers there must needs be a certain amount of exposure to the predisposing and exciting causes; and no doubt among a community previously healthy we would expect that time is required to bring about the morbid changes of the mucous membrane, more especially in such a healthy body of men as the soldiers of the 22nd Regiment on their arrival in Malta.

Vesicular Bodies on the Lids.

Now what was the connection between the two types or forms, *i.e.*, the mild conjunctivitis of the first three or four years, and the pronounced indolent and untractable form which succeeded it? Were both only phases or conditions of one disease, *i.e.*, was the mild form specifically distinct from the granular? The circumstantial evidence just adduced most assuredly indicates some relationship by transitional stages, which, however, require to be well known before any positive conclusion can be arrived at. But there are conditions said to be even premonitory and characteristic which must of necessity first engage attention.

During the fourth summer, when granular ophthalmia was very prevalent in the other regiments that had served in the island for longer periods than the 22nd, I had my attention directed for the first time, to the existence of what are called the vesicular or sago-grain bodies on the mucous membrane of the lids.†

These I found were plentifully distributed, especially at the outer canthi of a goodly proportion of the men in the ranks. So very general were these abnormal structures that I noted the names of many of the men so affected in hopes of being enabled subsequently to find out what relative connection there existed between these bodies and subsequent attacks of ophthalmia. But in attempting to establish this relationship many difficulties present themselves; one of the most perplexing is the presence of these bodies in unmistakeable numbers in the lids of persons living apparently under good hygienic conditions as regards space, ventilation, and climate; *i.e.*, supposing these vesicles are the product of vitiated atmosphere. But many persons with them on their lids, whilst unwilling to admit any such causes as the above, sleep in rooms from which fresh air is religiously excluded, and in beds surrounded by closely-fitting curtains; indeed, the exclusion of fresh air from dwellings so constructed as to afford every facility for proper methods of sanitation is remarkable, and nowhere have I seen this more practised than among all classes of the native population of Malta, who, with few exceptions, shut up windows and doors during day and night, under the foolish belief that the depressing sirocco and unpleasant winds are to be excluded in this manner.†

* Dr. Marston, who then directed my attention to these bodies, published subsequently an able paper on Ophthalmia as it appeared among the Troops serving in Malta. *See* "Beale's Archives," No. XI. 1862. Mr. Welch, 22nd Regiment, also furnished a detailed account of the epidemic we are considering, especially with reference to the etiology and value of the vesicular bodies in connection with ophthalmia. *See* "Army Medical Reports," Vol. V., p. 494. There is also the carefully conducted observations of Dr. Frank, Vol. II., p. 400.

† But this habit is not rare in England among even the better classes. Happily the curtained bedstead is getting less common; indeed, the custom still prevails to a pernicious extent, especially among the lower orders, but not altogether among them; for example, a medical gentleman much disposed to throw what appeared to me an undeserved amount of doubt on the subject of the value of these vesicles and their connection with ophthalmia, displayed in his own person a rather watery condition of the eyes, and having informed me that he invariably slept in a closely-curtained bed, I ventured to suggest that he himself might be the subject of vesicular disease which, to his astonishment, was shown to be the case.

Now, from the foregoing facts it might be justifiable to infer that for one person not affected in a community like soldiers we will find 50 with vesicular bodies in their lids, provided they have been residing for some time in crowded barrack-rooms; and this, if true, is tantamount to proof positive that they are the product of foul air, at all events of defective hygiene. Indeed, from personal experience and the observations of others, I believe it is the rule that inmates of crowded, badly-ventilated dwellings are seldom free from vesicular lids, and in combination with climate, perhaps at all events poverty the condition becomes almost, if not entirely universal, keeping pace with the normal or abnormal surroundings of the individual.

Now, with reference to the 22nd Regiment, whether or not there existed a vesicular condition of the lids of the men before their arrival in Malta cannot be ascertained. It was especially noted, both by Mr. Welch and myself, when in Canada, that no less than 34 out of 114 men showed undoubted sago-grain bodies in their lids, of whom 9 were eventually attacked by granular ophthalmia, and, strange to say, none of them had ever been in Malta, or out of England, and were recruits just joined from the depôt. Subsequently, two other batches of recruits joined in Canada, amounting to 94 men, of whom no less than 23 had vesicular lids.*

I was at considerable trouble to verify the attacks of granular disease, and the preceding condition of the lids. From the year 1863, when the first inspections were began, up to 1869, when the disease ceased, I find the admissions and previous conditions of the lids to have been as follows:—

Years.	Admissions.	Admissions showing vesicles before Attack.	Number of Men Attacked.	Localities where Stationed.
1863.. ..	35	24	31	The Regiment served in Malta from June 1860 up to April 1866; afterwards in New Brunswick up to June 1869, when it arrived in Ireland.
1864.. ..	21	7	16	
1865.. ..	57	48	34	
1866.. ..	76	65	50	
1867.. ..	24	16	19	
1868.. ..	28	14	18	
1869..	16	10	13	
Total ..	257	184	181	

This Table suggests several important subjects for consideration. In the first place, it might be advanced (although a very strange consideration, still, I believe, a fact) that hundreds of persons living under the worst possible hygienic conditions, with their lids studded with vesicles, escape ophthalmia entirely, whereas, if we admit the communicability of the disease by contagion, and take into consideration the very insufficient means of ablution I shall notice in the sequel, is it not just as possible that the disease in the case of the 22nd Regiment, had been propagated by tainted secretions from the infected?

But if we allow that vesicles may remain dormant, or in undeveloped stages for a life time, or until the individual is subjected to the exciting causes, I will presently refer to; and that the persons affected in such cases are individuals more prone, through personal conditions, to be acted on by these

* But, from what I have seen since the arrival of the battalion on home service, I feel much disposed to believe that vesicular lids will be found to be general among the troops, with a still greater proportion of the soldiers' wives and children affected; indeed it would seem that this condition is inseparable from communities living for some time closely packed in rooms not properly ventilated. There can, I think, be little doubt of the greater prevalence of this condition among the soldiers' families, who spend most of their time indoors, and, unless in a few instances, are overcrowded, several occupying one room, with beds placed in corners and surrounded by curtains.

exciting causes, then I repeat, there must be few who will not see in the above data very strong presumptive evidence that the two conditions are linked together.

The graduation between the vesicular stage and true granular ophthalmia may be frequently so rapid that the patient is unaware of the first until he has been suddenly affected with violent inflammatory symptoms; moreover, such occurrences are remarkably common, as every one knows full well who has experience of the disease; indeed, the invasion of inflammatory symptoms in such cases often takes place in the course of a few hours. But the usual course is far more chronic, the eye appearing normal until the lid is turned down, when the vesicular bodies studding its surface will be observed red and congested, with a scanty mucous discharge, which occasions slight uneasiness and lachrymation on exposure to strong light, together with adhesion of the lashes during sleep. This may go on for an indefinite period, and eventually disappear or remain in a chronic state—neither getting better nor worse, or may run into active inflammation in one night.

Thus, in accepting the vesicles as being a premonitory stage of granular ophthalmia, we have to admit that unless the exciting causes are in full force they may remain for years without making any further progress, or indeed disappear entirely under improved sanitary conditions. Moreover, at all times, unless when irritated by meteoric influences or foreign bodies, they create little disturbance, and usually remain unknown to the patient or surgeon until carefully looked for, when they are observed either in clusters or sparsely scattered about at the outer angle of the lids.*

Without wishing to be thought dogmatic on this subject, I must aver that to the best of my researches in connection with these important bodies as premonitory conditions of a very obscure and most untractable disease, there is most assuredly very powerful circumstantial evidence of their value in the above data, and the fact that they are very common in the lids of persons inhabiting crowded, foul, and badly-ventilated dwellings, as compared with communities living under the best hygienic conditions.

At all events, this abnormal state of the conjunctiva, whether pathognomonic or not, of granular ophthalmia, must be accepted by even the most critical as a tangible fact, deserving far more attention than it has apparently hitherto received.

Specific Identity of Granular Ophthalmia.

Will the application of virus from the eye of a person suffering from granular ophthalmia, when introduced into eyes perfectly healthy and *free from vesicles*, produce the disease?

In fact, this question involves the absolute specific characters of the granular and other forms of conjunctival inflammations, as compared with the doctrine that imports all conjunctival inflammations as being only varieties of one morbid state, and liable to run into one another according to the nature, continuance, intensity, or otherwise of the predisposing and exciting causes.†

Now for examples. In Cairo and Alexandria we find a large proportion of the natives living under exceedingly bad hygienic conditions, and at the same time exposed to climatic influences which, beyond doubt, are extremely inimical to ocular diseases of every description. The result is a prevalence of bad forms of ophthalmia, the more virulent being the more severe. Moreover, it may be "like produces like," whilst contagion and infection add to the maintenance and spread of the disease among a community deteriorated in general health through insanitary modes of living.

Supposing this view to be the correct one, there is no difficulty in accounting for particular types becoming persistent in certain communities in accordance

* A powerful reading-glass is essentially necessary in examining for vesicles, more particularly in their earlier stages; indeed, in many instances, I have overlooked their presence with the naked eye, and confirmed them in numbers by means of a lens of ordinary power.

† Of course simple inflammation resultant of mechanical irritation, &c., as long as it maintains its simplicity and passes into resolution from the state of irritation, is an exception; but I opine only under these conditions.

with their hygienic surroundings, and, what is of much importance, viz., the persistency of any one state; thus the ophthalmia of the soldier in badly-ventilated barrack-rooms, and the native in the crowded, filthy lanes of Cairo, would each maintain a specific facies; or, in other words, should we not entertain views hostile to the belief that advocates specific distinctions between the various forms of palpebral inflammation, and admit a sort of "morbific selection" at work, by which the disease becomes modified or otherwise, according to the climate and mode of living of the communities among which it prevails? Is it stretching the facts beyond their endurance to reason, that the so-called Egyptian is a variety separable from the granular disease only on the score of more defective sanitation and meteorological influences? We shall presently see that the climate of Egypt has been from time immemorial, in all probability, the hotbed of ocular disease, and that bare and rocky Malta has been also notorious in this respect, so, if the Nile Valley and its deserts were turned into forest land, and Malta clad in arboreal vegetation, and there was abundance of shade to relieve the eye, that both countries would cease to maintain their well-earned ophthalmic proclivities.

Admitting the vesicular stage of the granular form to be a true premonitory symptom and the result of the crowding and bad ventilation of barrack rooms; at all events, that ophthalmia is produced by these causes;—now, we know for a fact that the overcrowding was tenfold greater at the beginning of the present century and up to the Crimean war, and therefore that, owing to the improved sanitation of the last ten years, granular ophthalmia has been getting less prevalent in the British Army.

These I believe are incontrovertible data, supported by accurate statistics. Again, supposing an army with a few corps in the condition of the 22nd Regiment, after three years' residence in Malta, were suddenly landed in Egypt, exposed to the trying influences of climate and the contamination of the infected natives, need we be astonished if the granular form should at once be replaced by a severe purulent disease; moreover, that this type or form producing its like by contact would be introduced by the soldiers subsequently into other corps and communities until after a time it became modified, and again lapsed into the monotonous sameness of that disease familiar to almost every Army Surgeon as "granular lids."*

Climatic Causes.

On referring to the ancient medical and historical literature of Greece and Italy it will be found that ocular, or ophthalmic disorders prevailed to the greatest extent during the spring and autumn equinoxes; and exactly the same obtains at the present day along the entire basin of the Mediterranean; indeed, there is no meteorological conditions known to us in connection with the form now under consideration, and perhaps other varieties of conjunctiva inflammation that have not been noticed by the ancient medical writers.†

Moreover, Hippocrates, Galen, and Paulus Ægineta dwell with singular emphasis on the etiology of ophthalmia in connection with the vernal and autumnal changes; and surely in their 'οφθαλμια, ιρωωδεες, there must be some connection with the eroding ulcer which characterizes the worst form of the disease—indeed, we read in them and in Celsus, of "watery ophthalmias of a "chronic character, with pains, fungous excrescences of the lids internally and "externally, called *fici*," the corneal ulcers, which destroyed the sight of many persons.‡

* I was at some trouble, when in Egypt in 1863, to find out whether purulent ophthalmia was at all common, and after inspections in several of the crowded quarters of the chief cities, it became apparent that this disease is still present, whilst granular states are often more prevalent than healthy lids. In various parts of Constantinople I have noted the same, and it is well known (as was the case in many regiments in Malta) that during an epidemic, sporadic instances occur of most severe and destructive attacks, equalling in their violence and intensity any recorded during the famous Egyptian campaign.

† We have the historian Herodotus, B.C. 440, stating that the Egyptian oculists were famous in the days of Cambyses Thalia III.

‡ Hippocrates' Works, Sydenham Society's edition. Vol. I, pp. 356–304, with Translator's Commentaries.

In respect to the lower animals, it is stated that pigs raised in badly-ventilated styes, and also bears and other quadrupeds in closely-constructed buildings, contract ophthalmia in no way different from granular lids, which, if the case, is another proof of bad hygiene being the chief predisposing cause.*

Contagion and Infection.

It is an acknowledged fact that the secretions from an inflamed conjunctiva readily kindle up a corresponding condition when applied to a healthy surface. Moreover, that this is a fruitful mode by which the disease is propagated can scarcely be doubted, more, however, in crowded communities in civil than military life, but everywhere, provided there are facilities; perhaps, however, not to the extent generally supposed. I am not aware that experience has fairly established the limits,—to wit, when in a given case the virulence commences, when it is most potent, and the stage at which the secretion fails to produce its like.

Perhaps nothing short of a perfect normal state holds forth any security on this point; and considering the length of time before that takes place in the chronic forms, and the very minute amount of secretion from diseased surfaces capable of originating similar conditions, we may well suppose that a number of soldiers with their eyes affected by chronic inflammations will be dangerous subjects in a barrack-room, more especially where such arrangements as the following exist:—One company of the 22nd Regiment was quartered, in 1864, in huts in an outwork of Floriana, Malta; there was no ablution-room, and the only water supply was procured in buckets from a cistern distant about 200 yards in the ditch below. Now in this company there was a man who had suffered from granular lids, which were still discharging scantily with the mucous membrane in that thickened and abnormal state which may last for months or years after the disease has to all outward appearances been cured. In the course of a few weeks afterwards several cases of granular disease occurring among the men necessitated a careful inquiry into the probable cause or causes, when, in addition to what has been stated, it was shown that there had been a custom at early, or "rouse parades," in order to get through the morning ablution with dispatch, for sometimes six to eight men to wash in the same water, and dry their faces with each other's towels.

Without absolutely asserting that the disease in this instance had been propagated by the above method, I have ascertained that this practice obtains pretty generally in corps when the men are pinched for time at the hour stated. The example furnished is perhaps feeble, being only 1 affected man in 50; but what might be the results in regiments deeply tainted by the disease? I have numerous other examples tending towards a probability that ophthalmia is frequently communicated among soldiers in this way. As regards civil life, there would I apprehend be no difficulty whatever in adducing convincing proofs of its being propagated in the same manner.†

Taking the cases of corps deeply tainted by ophthalmias, and considering the communicability by way of transfers to and from battalions, depôts, &c., together with the well-known personal indifference of the soldier in regard to ablution, it may just happen that occurrences of the nature above mentioned may be more frequent than have been supposed; we must allow, at all events, that they suggest certain important sanitary precautions which should not be overlooked by the Medical Officer.

It has been stated by observers that the zinc basins are injurious to the eye from chemical deposits on the surface; but to the best of my experience, any deleterious accumulations on the metal seem to arise entirely from want of attention to cleanliness, and in allowing the foul water to remain standing in the utensil after use; it is, however, by no means well suited for soldiers; even the

* According to Stromeyer, grey granulations, as a rule, were present in the lids of pigs living under unhygienic states, whereas these never obtained with the well tended.

† It is a belief among the Maltese civil practitioners that the disease is very often carried from person to person by the common house fly, which is well known to infest the eyes of persons suffering from ophthalmias.

patent apparatus of Jennings often fails in fulfilling its objects,—viz., efficacy and durability,—being apt to get out of order through carelessness and rough usage. Wherever water can be procured in abundance there is no safer plan with such indifferent mortals as soldiers, than a constant moving body of water; hence a running stream is the safest.

Each man might be supplied with a basin lined with porcelain, and instead of leaving it in the ablution-room, display it with his towel and kit at his bed side. One basin to every 10 men necessitates a scramble in the usually small washing-rooms, unless the ablutions are begun in good time, which every one who knows the habits of the soldier will find is seldom the case.

Telluric emanations are stated to have been a cause or causes of ophthalmias, more especially in malarious districts, but no distinct proofs are forthcoming. As to the propagation of these diseases through the dissemination of their products in the atmosphere, there may be yet much to learn; certainly, if the effluvia from choleraic and typhoid evacuations, &c., can be shown to communicate these diseases, there are excellent facilities for a like distribution of the *fomes* of ophthalmias in the wretched underground cellars of Malta, nay, among the soldiers in their badly-ventilated barracks, where the atmosphere is frequently very impure, especially at night.

Malingering.

Now and then suspicious cases may occur, more especially in bodies of soldiers among whom the disease has prevailed for a long time; but instances of the wilful introduction of tainted secretions and foreign bodies into the eyes, either to induce or to maintain disease, would seem now-a-days to be rare, and most assuredly strict attention to the conditions of the affected, in and out of hospital will greatly reduce the chances of tampering with eyes, supposing there is any disposition among the men to resort to such proceedings for the purpose of evading duty or obtaining their discharge.

At the same time it should be well borne in mind that as long as chronic ophthalmia is restricted to the palpebral membrane it is not in general a painful disease, and might be easily kept up by local irritation for indefinite periods; but on the other hand, it is no less true that sudden relapses are characteristic features of the granular form, and therefore apt to give the semblance of design to what is often doubtless the result of meteorological and other conditions to which chronic inflammations of the conjunctiva are well known to be extremely sensible.*

High Temperature and Solar Reflection.

High temperature with strong light, more especially in countries devoid of arboreal vegetation and verdure, such as Malta, has unquestionably a very injurious effect on weak eyelids. This is apparent in the number of primary attacks and sudden relapses among soldiers on exposed posts, especially during the extreme heat of midsummer; indeed, numerous instances of sudden attacks of ophthalmia under these circumstances, have led me to the belief that the above are among the chief (exciting) causes, especially where the premonitory vesicular condition exists.

The reflection from bare rocky surfaces and glare of snow are potent causes of severe conjunctivitis. An instance occurred to myself and 30 native attendants in crossing a snow-covered pass on the Himalayas. Although only exposed to the intense solar reflection for three hours, all were attacked by severe conjunctivitis, the membrane in many cases becoming very much swollen. We rapidly recovered, however, as soon as the wooded and grassy valleys and plains were gained, whilst the application of snow to the inflamed surface greatly relieved the pain, and subdued the intensity of the symptoms.

* Several examples of wilful introduction of foreign bodies, such as chalk and tobacco, have come under my notice, and instances of irritation of the diseased surface, for the purpose of maintaining the inflammatory condition, are also well known, especially among discharged men drawing limited pensions for ophthalmia.

It was, moreover, a custom with the natives of these alpine regions to make shades for the eye out of leaves of plane trees; these proved such excellent protectors that few who used them suffered from inflammation of the eyes.

This leads to the consideration of peaks to soldiers' forage caps. The Artillery and 22nd Regiment did not wear them during my sojourn in the island; but there cannot be a doubt that the peak of the French *kepi*, curving upwards, is an excellent protection to the face; certain, however, the eye suffers more from the reflected than direct rays of the sun.

It was a belief among many of the sufferers from ophthalmia that the disease was excited by perspiration from the forehead getting into the eye during military evolutions, and accordingly it was a habit with the men to place a pocket-handkerchief on the forehead within the shako.

Scorbutus and Deteriorated Health.

Inspector-General Dr. Taylor held an opinion that the prevalence of ophthalmia at the Cape was owing to a generally diffused scorbutic taint among the men.*

I have no experience whatever of this condition in connection with epidemic ophthalmia, but it was notoriously the case in Malta that the disease prevailed to the greatest extent, and showed the most inveterate cases in corps remarkable for a low standard of general health, evinced by a general pallor of countenance; this I repeatedly observed in the 2nd Battalion of the 22nd Regiment, and also in the 2nd Battalion 15th Regiment, both of which were then suffering very much from the granular disease. I believe that when the general health falls below par, then the disease becomes obstinate, whereas by removal of the affected to fresh country air, little further measures seem necessary; indeed, it would seem there is no more potent remedial measure in granular ophthalmia than the transferrence of the patient to a well-aired and ventilated hospital in some well sheltered country locality.

I have known several instances of soldiers who had been discharged the Service on account of most inveterate granular disease, completely recover after a residence in the country.

Draughts of Cold Air.

Cold winds and draughts of air are no doubt potent causes of primary attacks of ophthalmia, and few are more productive of relapses. This was notoriously apparent in the 22nd Regiment on the voyage from Malta to North America in 1866, especially on arrival in St. John's Harbour, New Brunswick, in April, when the ice was breaking up on the rivers. Here the battalion lay exposed on shipboard for 11 days, during which no less than 8 relapses occurred.†

The transitions of temperature in spring and autumn, especially when accompanied by gales, are therefore the worst seasons to move a body of men in whom ophthalmia is endemic.

Lowness of temperature, in particular, a dry cold, such as obtains in the interior of Canada, is most decidedly salutary. All the ophthalmic cases improved in mid-winter, when the thermometer frequently stood for weeks under zero of Fahrenheit; but when rapid transitions appeared (that is, when the thaws of March and April set in) relapses were prevalent; indeed then in the course of a few hours, a condition which had seemed to give an assurance of speedy recovery, becomes suddenly very much aggravated, so much so that you feel disposed to accuse the patient of having tampered with his eyes.

* Vol. V. p. 339, "Army Medical Reports."

† This might have been easily prophesied before the corps left Malta, inasmuch as during my inspection of the men previous to going on board ship I noted 100 and upwards who had never been the subjects of ophthalmia, with their lids in conditions that would most assuredly have eventuated in granular disease had the battalion remained in the island during the following year.

Local Influences.

The physical aspect of the Maltese Islands, as compared with Great Britain, is especially favourable towards the production and maintenance of inflammatory disease of the eyes—in these ways—the surface is for the most part rocky, there is a remarkable deficiency of trees of all kinds, and more especially a perfect absence of agrestic verdure in summer, so that the eye gets no relief from the constant glare and reflection of a semi-tropical sun. This exposure after five or six years was, in the case of the 22nd Regiment, suddenly altered on removal in 1866 to the shaded forests and evergreen verdure of a Canadian country town, and, in conjunction with a healthy climate and ampler space, told most satisfactorily on the progressing ophthalmia which for the six previous years had more or less devastated the regiment.

So marked was this change that I verily believe it would be difficult to obtain a better instance of the value of improved sanitation on ophthalmia than that presented by the above corps after removal to the backwoods of New Brunswick; moreover, it will be apparent that the disease increased rather than diminished year by year during the residence of the battalion in Malta, and therefore these facts suggest a not inappropriate homily, on how far it is prudent to retain bodies of men for such long periods under such circumstances.

Dust and Foreign Bodies.

Fine particles of sand and foreign bodies are frequently put down as direct causes of ophthalmias; their irritant effects on healthy conjunctiva and (vesicular lids?) doubtless induce inflammation readily; but the above, I am much inclined to believe, are by no means prevalent exciting causes.

With reference to Egypt, Scinde, and desert countries, where dense clouds of impalpable dust are constantly being carried about by the winds, we find that the persons most exposed to their influence suffer the least from ophthalmia; indeed, it has been repeatedly observed that the Arab of the Desert and natives of sandy tracts of country present remarkably clear and brilliant eyes as compared with the denizens of the crowded cities—to wit, Alexandria and Cairo, more especially the pauper class, among whom as before stated ophthalmias are notoriously prevalent.*

As regards Malta, we find all its rock formations and surface soils contain a large percentage of carbonate of lime; that the former are soft and easily disintegrated by the weather, more especially the calcareous freestone on which Valetta and all the chief military quarters stand. This sandstone disintegrates readily, and is composed of minute flocculi of lime easily disseminated by the winds, and seeing that the latter prevail to their utmost extent in spring and autumn, it is fair to suppose that the dust storms have then something to say in intensifying the ophthalmia, and no doubt in persons predisposed,—for example, through the presence of vesicular disease,—such would be highly injurious, but otherwise there does not seem to me any very clear evidence to cause us to lay great stress on their etiological influence on the ophthalmia which prevails in the island or elsewhere; moreover, in seeming contradiction to simply heat, radiation, and dust being the sole causes of the disease, as it appears in desert countries, it is the case in Malta that the Officers of the Army, together with the British and Native residents of the middle and upper classes although equally exposed to meteoric conditions, do not suffer in any such ratios as the soldier and lower orders of natives among whom ophthalmias have always been prevalent; and seeing that the two latter exist under precisely the same unsanitary states, viz., defective space, ventilation, ablution, &c., we may safely refer the disease to their abnormal modes of life. To be more explicit—the soldiers occupy badly-lighted, badly-ventilated quarters; many not originally constructed as such and merely utilised as barracks, whilst the poorer classes of Maltese, among whom this disease has been prevalent from

* A stroll through the crowded and filthy quarters of these cities and the back lanes of Valetta will at once demonstrate this fact; moreover, I constantly observed in the latter that the females and children were far more subject to ophthalmia than the males, which was accounted for from the circumstance that the latter generally spend at least 12 out of the 24 hours at their employments in the open air.

time immemorial, live in darkened cellars, narrow streets, and are also crowded to a most injurious extent.*

Among the latter there is a marked persistency of granular ophthalmia in families; indeed, among the narrow lanes of the over-crowded cities, almost every second woman or child shows signs of the disease, and, perhaps from habit, little account is taken of an attack, so that, as in Egypt, it is looked upon in the light of an infantile malady to which children are more or less liable.

It is well known in Malta, as well as in Egypt and in other Oriental lands, that a pretty child is only safe from the influence of the "Evil Eye" when its beauty is hidden by a dirty face or an attack of ophthalmia. Thus, whilst the parents dread the disease themselves, from its disposition to become chronic, they learn from good experience not to attach this importance to it in children, in whom, although acute at first, it frequently subsides without bad consequences.

Curative Measures.

Once ophthalmia has become fairly endemic in a body of soldiers, there will be no end to the amount of inefficiency it may produce. Supposing such a case, in the absence of the removal of the corps to a more healthy locality, there remains for the Surgeon to seggregate all cases presenting any tendency to the disease whenever circumstances will in any way allow. Rooms in barracks, tents, or marquees should be set apart for men with weak lids. Every man should possess a basin and towel, and a strict enforcement of orders in connection with ablution should be carried out under the surveillance of non-commissioned officers; inspections of the corps should be frequent, and on no account should men with abnormal states of the lids be allowed to live with the healthy. Indeed, a corps suffering from the disease is inadequate for the calls of active service, therefore the sooner prompt and efficient measures are had recourse to the simpler and easier will be the process of extermination.

An airy, well-ventilated barrack and hospital would of themselves, sooner or later, effect this, provided everything in connection with hygiene is fully carried out. Moreover, on no account should men be returned to their corps for duty until all appearances of the disease have vanished. When we come to think of the hundreds of soldiers subject to ophthalmia at one time or other in an infected regiment, and the numbers of convalescents that may, to all external appearances, show healthy lids, yet on examination present marked indications of disease (*i.e.*, provided we admit the virulency of the secretions), and that these men live, sleep, and wash in the same rooms, and use the same towels with the healthy; I repeat we may surely conceive that, under such circumstances, there need be no wonder that granular ophthalmia will maintain itself in the ranks for many years.

In the treatment of granular ophthalmia nothing perhaps is so important as the sanitary condition of the hospital and its surroundings. Many military and civil hospitals are absolutely inimical towards the recovery of such cases, and the confinement to their badly ventilated and imperfectly lighted wards, with absence of proper open-air places of recreation, tend in the long run to produce a deterioration of the patient's general health, which seriously retards convalescence. Under such circumstances, when the treatment has extended over several months, I have often been strongly impressed by a belief that my local remedies were useless, and on more than one occasion that several applications which in earlier stages did good seemed now to have no effect, one way or the other; indeed, many such cases rapidly recover of their own accord on being removed to a healthier hospital.

There can be no doubt that wherever ample space and the usual desiderata

* There is an assertion current among the Maltese (and I have heard it confirmed by medical practitioners), that the severest form was introduced into the islands in 1800 by British troops after the Egyptian campaign, and that the town Zietun (where, it is stated, the disease was first established) has ever since been notorious for a dangerous form of ophthalmia. The above origin may be doubted, but from what I could learn and observe there seemed to be more chronic ophthalmias, blind and blear-eyed persons in Zietun than elsewhere in the islands.

for maintaining health are strictly observed, granular ophthalmia can never become endemic. It is most assuredly a disease of crowded communities, and there is as little question as to its having been generated and maintained in the British Army entirely through unhygienic conditions of living. Moreover, taking into consideration the gregarious and careless ways of soldiers, together with the inefficient means of ablution (still not rare in many garrisons at home and abroad) we need not wonder at ophthalmic diseases being of frequent occurrence and assuming an endemic form for indefinite periods.*

Setting aside the sanitary precautions and therapeutic treatment of ophthalmia, I believe the disease will often work its own extinction much as follows: for example, out of 171 men of the 22nd Regiment affected with granular disease during the 11 years, many of them having had constant relapses and maintained for many years abnormal thickening of the conjunctiva, there were 87 discharged the Service in 1867–8–9 and 70, either on their own account or for other reasons, leaving 84 men whose eyes at present (July 1870) show perfectly healthy conditions. Now by this data I do not mean to affirm that the removal of more than half of the persons with weak lids brought about the results named, but only to show their value in conjunction with sani ary measures, the importance of which cannot be gainsaid.

Once the subject of granular ophthalmia, the chances are that the individual will be liable to the disease, or will at all events be often threatened with relapses on exposure to the usual exciting causes; indeed, unless under very favourable circumstances, it is rare to get off with merely one severe attack.

The flabby condition of the lids with thickening of the palpebral conjunctiva, so frequent a sequel of the disease, and often lasting for years (the patient being subject to occasional irritation about the eye during windy or variable weather), no treatment applied directly to the diseased surface seems to benefit, whilst country air and out-door exercise in verdant and tree-shaded districts, by gradually accustoming the eye to light, act most beneficially.

Strong solutions of astringents applied both inside and outside with the view of reducing this relaxed state of the lids, have never seemed to me to be of any service in very chronic cases; at all events, if no immediate good results follow there appears very little inducement to continue them.

The therapeutic treatment of the disease in all its phases might form a small volume, but the chief remedies, I opine, are nitrate of silver, sulphate of copper, zinc, opium, and belladona, of various strengths, according to the intensity or otherwise of the conditions. The disease, provided the hygienic surroundings of the individual are in every respect favourable, has, like many others, a wonderful tendency towards health; still I have been frequently surprised not only by the amount of the granulations on the lids and their rapid reproduction, as by the happy results, after a constant and extensive denudation of the surface has taken place through a steady and assiduous destruction of the morbid states by means of various applications.†

Indeed it is surprising the amount of denudation of the surface of the lids that may be kept up for months, and after all a perfect recovery result; at the same time, it is very apparent that much dexterity and care are needed in the removal of granulations from the lids; indeed, I believe that eyes may be lost or saved very much according to the judgment of the Surgeon.

Solutions of caustic, stimulant and astringent salts, &c., applied by camel-hair brushes, according to the requisite strength, and by studiously isolating the applications to the parts requiring to be removed, comprise all the secrets

* There are said to be regiments of infantry seldom free from granular ophthalmia, inasmuch as although few cases may occur on home service; but when the corps move to tropical climates and foreign stations, where the exciting causes are in full force, the disease constantly re-appears.

† Rock salt is a favourite and heroic mode of destroying exuberant granulations in Turkey. I suddenly came on an old crone by a hedge-row close to Scutari, employed in scrubbing the eyelids of a man who was suffering from regular cauliflour vegetations; these she removed partly through rough scrubbing, and partly by a sort of pickling process, the undetached portions being very much like salted meat. In this case some good results followed; at all events, the man confessed to me a week afterwards that wonderful relief had resulted, although the eye itself seemed to have been destroyed by the disease before the pickling treatment had been tried.

of the successful ophthalmologist. The old "random drop" plan, by which solutions were inserted into the eye, very seldom produced the good intended, as they rarely reached the evil, or were not potent enough; thus, frequently the mechanical irritation of a figment of granulation on the upper lid will not only originate but maintain the existence of a destructive ulcer of the cornea. Some destroy exuberant granulations by powerful escharotics, but the cases usually met with in the Army would scarcely seem to require such potent measures; besides, very great care is required in confining a drop of pure nitric acid to the exact spot intended to be destroyed. With the favourable sanitary conditions just mentioned many very inveterate cases yield slowly but surely to daily applications, which must be continued for months, whilst often, by omitting such remedies for a few days or weeks, the disease will gain ground, and eyesight may be lost. I have much faith in the persistence of treatment in inveterate cases of granular ophthalmia, believing that very many eyes have been saved thereby that would have been lost by neglect or only occasional trial of remedies. The mushroom-like rapidity wherewith the granulations sprout up even after repeated destruction is well known, hence every attention should be shown to this condition of the lids for many weeks, even months, after the granulations have been destroyed.

APPENDIX No. XV.

GRANULAR OPHTHALMIA.*

By Assistant-Surgeon WELCH, 22nd Regiment.

THE important position which this disease maintains in the Medical Statistics of the British Army, both in reference to temporary inefficiency and permanent loss; its existence among the poorer communities of these islands†, and common to all countries where squalor and impure air—the concomitants of poverty abound; the gravity and chronicity of the local lesion compared in extent to other structural diseases, consequent on contiguity with the visual organs, with the frequent defects or total loss of sight as sequelæ by which youth is marred or able-bodied adults rendered helpless and a burden on the community at large, with all the attendant wretchedness and misery; demand the assistance of all for the elucidation of its phenomena and deductions for its eradication. The following observations on the disease, dispersed over a number of years, are mainly derived from the 1st Battalion 22nd Regiment, supplemented by data from the military and civil elements indiscriminately. It is in the former that the opportunities of watching the early phase of the malady and its development are most frequent, while among the applicants at civil ophthalmic hospitals, the profound organic changes from long continued morbid action predominate; the constant supervision, the great controlling influence, the variations in climate, the massing of large numbers under known conditions, existent in the military element, allow of accuracy of data and general deductions not obtainable in civil life; while the identification of the disease—the elementary structures and phases discernible alike in one or other community under similar conditions being acknowledged—renders the observations gleaned from one segment generally applicable, unmodified but by the forced circumstances pertaining to military life as contrasted with the civil section.

Ophthalmia in the Army generally.—The most cursory examination of the records emanating from time to time from the Army Medical Department will demonstrate that this disease did, and still does, play a most promient *rôle* in the production of sickness and invaliding in the British Army—a *rôle* which demands a much greater share of attention than has hitherto been accorded to it. "During a period of 27 years, ending 31st March, 1854, 2,648, or 5·8 per "cent. of 45,411 invalids were discharged from the service for impairment of "vision. During the last six years of this period the percentage had risen to "7·5." "Of 16,654 soldiers found unfit during the six years ending "December 1860, 1,393, or 8·4 per cent., had been rendered ineffective by "diesases of the eye; and during the year 1860, 9 per cent., or nearly 1 in every 11 invalids, were discharged on account of defective eye-sight."‡

In this category is included *all* diseases of the eye followed by defective

* I limit the term "granular ophthalmia" to that variety of conjunctival inflammation preceded by chronic follicular hypertrophy; the latter phrase synonymous with "sago grain bodies," "vesicles," "grey granulations," and expressive of an abnormal state of certain physiological elements of the conjunctiva normally invisible to the naked eye—the closed solitary follicles.

† The numerous instances of blindness among the occupants of asylums, the beggars, and lower class in the south of Ireland, from disorganization of the eye-ball, and the partial defects of sight from corneal opacities so common among servant girls, the sequelæ of this ophthalmia, substantiate its existence equally with the applicants at the various ophthalmic hospitals studding the larger towns of the British Islands.

‡ Frank, "Ophthalmia Chronica," Army Medical Report, 1860, p. 400.

vision, and at first sight might appear ill-adapted for expressing any accurate idea of the prevalence of the conjunctival lesion designated in statistical nomenclature by the term "ophthalmia chronica," yet, as it is indubitable that the major part of the lesions terminating in defective vision and causing invaliding in the Army have, as a commencement, follicular conjunctival disease, the inference of its wide-spread existence and virulence during the period 1827–60 from the above data is not invalidated.

From 1861–67 inclusive, while the annual average ratio of admissions from all diseases for the whole Army, calculated per 1,000 of strength, was 1,114, ophthalmia contributed 42·9—the one disease furnishing rather more than 1-26th part of the whole temporary inefficiency in the Service; and during the same period the permanent loss was 1,572, or 4·8 per cent. of total discharge from the Army.

As contrasted with the decennial period 1837–46, during which the average annual admissions from ophthalmia mounted to 80 per 1,000 of strength, or rather more than 1-12th of whole sickness, a marked decrease in the prevalence of the disease is apparent, more especially during the later septennial period 1861–67, ranging from 1-20th of total admissions in 1861 to 1-32nd in 1867, with a corresponding decrease in discharges from the Service from 5·4 per cent. in 1861 to 3 in 1867—an all but gradual subsidence both in prevalence and amount of impairment characterizing this period.*

Thus, while adding in nowise to the mortality, this disease, in spite of the progressive decrease marking the later years, still plays a most important part in producing temporary and permanent loss of service in the Army, constituting on foreign stations, where endemic, "the most frequent cause of per-" manent inefficiency and invaliding," and throwing an able-bodied man, unfit for a soldier, a burden on the community for his maintenance.

Although, at first sight, the frequent movements and varying conditions under which the troops are cast during a tour of foreign service might appear to militate against any general deductions drawn from the Army as a whole, yet a careful perusal of the Annual Medical Reports will furnish several very important items in reference to the relative prevalence of ophthalmia under the diversified climates and stations occupied by the Army, and especially in the individual regiments and corps forming the garrisons from time to time. It will be apparent, taking as an exponent the data furnished by the Blue Books for 1861–67, that:—

(*a*) The ophthalmia in the Army quartered in the United Kingdom is mainly derived from the depôt battalions,† the receptacles of those invalided from foreign stations, but not discharged from the Service, or a regiment endemically affected during its late tour of foreign service.

(*b*) The prevalence of the disease under different climates varies greatly, constituting 1-11th part of admissions, with 16·7 per cent. of discharges, at the Cape of Good Hope; 1-15th, with 12·47 per cent., in the Mediterranean; 1-37th, with 2·8 per cent., in North America; 1-38th, with 6·3 per cent., in India,‡ and 1-51st with 2·1 per cent. in the United Kingdom.

(*c*) Malta, the Cape, and some of the stations in India—notably the northern and Scinde districts in Bombay, and certain garrisons in the plains of Bengal and Madras,§ are the quarters of the Army

* The respective annual admissions for the whole Army for 1861–67, calculated per 1,000 of strength are,—59·, 57·5, 48·4, 35·4, 33·, 35·5, 32·; the discharges from the Service for the corresponding years expressed as a percentage being 5·4, 5·3, 5·2, 5·8, 4·6, 3·8, 3.

† The average annual admissions during the period per 1,000 of strength were: Household Cavalry and Foot Guards, 6·3; Depôt Battalions, 29·5; with 1 per cent. invaliding in the former, 4·3 in the latter.

‡ The averages per 1,000 of strength were:—Bengal, 43·6; Madras, 33·; Bombay, 49·2; the division of the stations from elevation above sea level, as exemplified in Madras, being—seacoast, 22·4 per 1,000; plains and table-lands, 39·3; hill stations, 22·9, the latter fluctuating from a yearly average of 4·2 to 41·3, consequent on the prevalence or otherwise of infected corps.

§ Army Medical Report, Vol. 8, p. 153.

on foreign service maintaining a high general average; the remainder fluctuating very greatly.

(*d*) In those stations maintaining a high general average and regarded "as hot beds of the disease," "fostering seats of ophthalmic "germs," the remarkable manner in which some regiments escape entirely, others only slightly infected, or severely, with no corresponding ratio to length of service, indicate that some cause essentially of a limited nature—*e.g.*, certain barracks—affecting individual corps, and not dependent on climate as its direct agency, must be sought for in elucidating the etiology of the disease.

(*e*) A high sick list from ophthalmia in the "variable ratio" stations is directly traceable to the importation of an infected corps, the disease assuming high proportions on its advent, and departing with it, the previous and subsequent absence clearly contra-indicating climate or local peculiarities of soil or barrack as cause; to wit, the excess in Dublin in 1861 from presence of 87th Regiment from China; in the Windward and Leeward Command in 1861–62, from the 21st Regiment from Malta; in Canada in 1859, and in Bermuda in 1860 from the 39th Regiment, and the reduction in the former station from 35 per 1,000 of admissions in 1859 to 11·7 in 1860, on its departure; in Jamaica, in 1860, from 1st Battalion 14th Regiment from Mediterranean (disease originating in Malta, and furnishing 120 out of 190 total admissions from ophthalmia in 1859 in Corfu) from 102·7 per 1,000 in 1860 to 8·8 in 1865, when regiment removed; in the Mauritius, in 1863–64, from the 2nd Battalion 13th Regiment from Cape, and in 1865, from the 2nd Battalion 22nd Regiment from Malta; in New Brunswick, in 1864–65, from the 1st Battalion 15th Regiment; and in 1866, from 1st Battalion 22nd Regiment from Malta; in New Zealand, in 1865–66, from the 2nd Battalion 14th Regiment, and 50th Regiments; in 1865, the decrease at Aden and excess at Kurrachee by the transferrence of the 95th Regiment; in Australia, in 1866 on transferrence of 2nd Battalion 14th Regiment from New Zealand, and in Japan, in 1866 from 2nd Battalion 9th Regiment, from China.

(*f*) The frequent instances of European Regiments suffering whilst the Native force and inhabitants generally permanently exposed to climatic agencies remain exempt, the limitation of the disease as exemplified in the band and drums of the 70th Regiment, in New Zealand, in 1862, the wing of the 50th Regiment in Ceylon from 60·3, the marked contrast between corps in the same district, the remarkable exemption so frequently displayed on the part of the Cavalry, Artillery, and Engineers quartered in a station with their infected brethren of the Line—the segment of the Army constantly producing a relative high ratio of admissions and invaliding—all demonstrate indubitably an agency otherwise than climate.

(*g*) As few battalions escape a sojourn during foreign service in Malta, the Cape, or an "hotbed for ophthalmic germs" garrison in the plains of India, few avoid the taint of the disease among the rank and file; and that, while a regiment or corps may remain in Malta or the Cape for four or five years and enjoy an immunity (no doubt from escaping a residence in certain barracks), yet, as a rule, a two years' occupation of unsanitary quarters in these stations renders "follicular disease" of the conjunctiva all but universal among its components."*

Other points also to be noted are—the remarkable persistency of the disease in certain corps for several consecutive years, *e.g.*, 1st Battalion 15th Regiment and 76th Regiments, stated by the Surgeons in 1859 as "prevalent for a "number of years," and the effect of removal of corps from stations originat-

* "169 cases of chronic ophthalmia passing through Chatham in 1860 as invalids "represented 57 different regiments, three only of which belonged to the Cavalry, the "rest to the Line." Report, 1860, p. 404.

ing the disease, followed by a gradual subsidence under favourable sanitary conditions, or an immediate severe exacerbation, provided rude climatic influences are in the ascendant, the latter not incompatible with a retrogression of the morbid follicular elements, *e.g.*, the 1st Battalion 22nd Regiment on transferrence from Malta to New Brunswick in 1866.

In the face of the wide-spread existence of ophthalmia in the Army at the present day, in spite of all the means of isolation, segregation, &c. (on the presumption of the disease being maintained by contagion) at hand in a strongly disciplined community, it becomes an important point to ascertain, in view of its eradication, whether we are to search for its origin and diffusion in an introduced ingredient disseminated by contact, or as springing up *de novo*, developed from, and maintained by, a primary independent element, the direct sequel of the combined conditions under which the soldier is placed in certain barracks on foreign stations during his terms of service. The history of the disease is adduced in favour of the former assumption.

History of Ophthalmia in the British Army.—The author of "Practical "Hygiene"* states that "epidemics of military ophthalmia (grey or vesicular "granulations and rapid purulent ophthalmia) seem to have been uncommon and "perhaps unknown on the large scale in the wars of the 18th century. The "disease as we now see it is one of the legacies which Napoleon left to the world. "His system of making war with little intermission, rapid movements, "abandonment of the good old custom of winter quarters, and intermingling "of regiments from several nations, seem to have given a great spread to the "disease, and though subsequent years of peace have greatly lessened it, it has "prevailed more or less ever since in the French, Prussian, Austrian, Bava-"rian, Hanoverian, Italian, Spanish, Belgian, Swedish, and Russian armies as "well as our own. It has evidently been propagated among the civil popula-"tions by the armies, and is one more heritage with which glorious war has "cursed the nations."

Whether the ophthalmia as exemplified in the English Army of the present day is identical with (and dependent on introduction by communication) that characterizing other armies during the early wars of the present century is a fairly debateable ground. Egypt is the assumed focus of diffusion, and that a severe form of ophthalmia decimated the French and English troops in that country cannot be questioned, as well as that in the large standing armies of that period constant opportunities must have been in existence for the wide diffusion of any contagious malady; yet a study of the characteristic features of the disease then existent as ascribed by Mackenzie, Larry, and Asalini—its excessive virulence and quickness of involvement of the ocular tissues with destruction of the eyeball, and a contrast with the follicular conjunctivitis of the present day—its frequently slow and insidious approach, its postponement of implication of other tissues, and a limitation in the majority of cases to the conjunctival membrane, must tend to the inference that either two distinct pathological entities are here in question, or that change of time and place has brought about a strange modification in disease. The nature of the present lesion, the elucidation of its early stage, its *de novo* origin and persistence in spite of all attempts to extirpate by isolation, its prior existence in the Mediterranean†, Malta (Hennen), Lapland (Scheffer), "ophthalmia is bad among them, and sooner "or later, for the most part, they go blind from closeness of their dwellings and "smoke," its undoubted presence among the poor of Ireland anterior to the present century (Mackenzie), its general existence at the present day‡ wher-

* Dr. Parkes' "Practical Hygiene," 2nd edit. p. 466.

† "Hippocrates, Galen, &c., in the ancient literature of Greece and Italy, describe "clearly purulent ophthalmia, as well as the chronic form in the watery ophthalmias "with pains, fungous excrescencies of the lids, externally and internally, called "*fici*, which destroyed the sight of many persons."—Commentaries in Adams' Translation of Hippocrates' Works, Sydenham Society, Vol. i, pp. 356 and 503.

‡ Not a town on the borders of the Mediterranean, whether in North Africa, Southern Europe, or Asia Minor, but illustrates the disease among the denizens of the low haunts; in Egypt the chronic form, common elsewhere, prevails, not the virulent ophthalmia of old. The poorer Irish, the Russian peasant (Wecker), the degraded drunken specimen of North American Indian, indicate its wide range; it is a link in the chain of common humanity universal as pauperism.

ever squalor and poverty assert their authority, are not corroborative of its introduction during the Napoleonic wars. One feature characterized occasionally the Egyptian and invariably the present ophthalmia, "granular "lids," which, "although endemic in Ireland before the campaign, yet "received little attention until the severe outbreaks among the regiments in "Egypt and its disastrous sequelæ directed the attention of writers to the "point." (Mackenzie.) Other facts militating strongly against the idea of introduction are "that while the troops from Egypt after their return were "on the improvement, the English regiments most notoriously affected two "years subsequently had never served in the campaign;" also, the Portuguese "troops who fought side by side with the English in the Peninsular War "were not affected by ophthalmia until 40 years after their separation, *i.e.*, "1849;" "and from the association with the Belgian troops in the Pedro-"Miguelite War no such cases occurred in Oporto or elsewhere."*

Equally with the Greeks and Romans, from time immemorial the Egyptians have suffered from ophthalmia. Burton remarks, "Herodotus has two "allusions to eye diseases which seem to have afflicted the ancient Egyptians "from the most ancient times. But in the old days of idolatry the hygienic "and prophylactic practices alluded to by Herodotus, the greater cleanliness "of the people, and the attention paid to the canals and drainage, probably "prevented the malarious disease becoming the scourge it now is."† Asalini, Mackenzie, and Larrey, all looked upon the form of ophthalmia from which the troops suffered in Egypt as only an aggravated variety of catarrhal ophthalmia, and attributed it to the usual excitant agencies intensified by locality; the latter states that "the only means of its becoming contagious "was by direct conveyance of the matter from one to another," that "the "officers who were well hutted and tented and observed hygienic rules did "not get it," and that "when the troops *generally were placed under like* "conditions the cases became *fewer and less virulent;*" *he also remarks* "that the same form from which the troops suffered could be produced "in any country having the same atmospheric peculiarity as Egypt." Mackenzie substantiates the presence of eye disease "more among natives than strangers, "the lower than the higher classes of society, and in cities than the country; "rarely seen in private life;" features no less common to the chronic ophthalmia of the present day.

That the causes productive of follicular ophthalmia were exceedingly rife among the troops during the latter part of the 18th and early years of the present century cannot be doubted, and such as read by the light of present

* Adduced by Surgeon Marques in the Portuguese Army Returns for 1849–50 (quoted in *Medico-Chirurgical Review*, April 1863, p. 399) in support of his views of the granular ophthalmia in the Portuguese and other armies being of a catarrhal nature and origin. The history of the disease in the former is very instructive. Although always common among the civil population, the Army did not suffer until a year or two before 1849 among men quartered in the Destero at Lisbon (the disease endemic in this building, a civil establishment previously, for 23 years), slight granular lids being present. The spring of 1841, however, is regarded as the date of origin,—"the weather favourable to catarrhal attacks," "preceded by wind and rain," it affected all of the regiments in Lisbon, especially the Grenadiers and the 3rd Regiment at Vianna da Castello, 63 leagues distant; very irregular, however, in the Army generally. Surgeon Marques regarded it as severe catarrhal, and not introduced; the presence, however, of grey granulations, before the general attack of the men at Destero, and their wide prevalence subsequently (the early stage of the follicular lesion unmodified by any conjunctival inflammation being graphically depicted) are clear. In spite of the most rigorous quarantine, every precaution against communication, separate towels and basins, daily inspections, separate hospitals, classification of all ophthalmic men apart into classes, even the discharge from the Army in 1852 of all men with chronic lesion of the lids, did not prevent fresh cases in 1859. He attributes the prior immunity to the system of billeting the soldiers in the towns as well as in barracks. Hygiene and the abandonment of quarters (equally with the Danish troops) were most efficacious in reducing the disease. Its dependence upon a prior follicular element seems clear, and the whole phase of the outbreak is identical with those only two common in the British Army of the present day.

† "El Medina," Vol. 3, p. 176.

knowledge are universally associated with its *de novo* origin and endemic persistence. All the armies in Europe had become excessive in numbers, accumulated in camps and barracks* under unfavourable hygienic circumstances—the many being crowded into the space previously occupied by the few. It is well known the extent to which this was carried in the British Army when two men slept in the same bed, arranged in the barrack one tier above another, using the same basins and towels, with a complete ignoring of comfort, cleanliness, and ventilation, and continued long after the bustle and turmoil of warfare could be adduced as an excuse. Here were the circumstances favourable for the development of follicular enlargement, equally with the spread of any contagious affections. No wonder the importanee to which eye diseases attained, and no wonder that, not having been previously met with to such extent, with Egyptian experience fresh and deep-rooted, the French troops had to bear the onus.

That a strong line of demarcation differentiates the ophthalmia (retained as distinct by Larrey, Mackenzie, &c.), due to peculiarities of service in Egypt, from the follicular disease of our day (probably identical with that existent for centuries in the Mediterranean and Ireland) is clear; and while analogy from the occurrence of granular lids as an occasional sequel in the former would suggest the oft coincidence of the primary element† inseparable from the latter—"follicular hypertrophy," the causation of which most unquestionably must have been very rife, predisposing to any exceptional excitant under which the troops were cast,—yet, the phenomena characterizing the existent lesion and the circumstances under which it springs into an existence in regiments would unquestionably decide against its derivation from without, leaving as a problem its *de novo* generation and cause of endemicity.

The present century has witnessed standing armies as a permanence; hygiene has had but little scope until recent years, and the elucidation of the "grey granulations," with their requisites of development, explain fully the persistence of ophthalmia in the military world of Europe since the Napoleonic wars.

Phases characterizing Early Ophthalmia.—As exemplified in the Army Medical Returns three features assume great prominence in a body of men commencing ophthalmic:—(*a*) The general diffusion of the disease, *e.g.*, 120, 216, 133, 239, 137, 264 annual admissions in a regiment; (*b*), the slightness of the early cases—"mild, readily yielding to usual remedies," "of a mild type "and amenable to treatment," "simple conjunctivitis and generally yielding "speedily to appropriate treatment;" (*c*), the absence or extreme variability of any clear definable cause: the subsequent progress depending upon a continuation of the conditions under which the disease originated, and the amount of exposure of the susceptible follicular lids to external climatic excitants or any slight irritant.

History of Follicular Disease in the 1st Battalion 22nd Regiment.—The history of the 1st Battalion 22nd Regiment may be quoted as illustrative of the generation and development of the "grey granulations" as follows:—In 1860 this battalion was ordered to Malta on a tour of foreign service, arriving there during the summer. It was quartered in the Cottonera district, occupying the barracks at Isola Gate, Polverista, Zabbar, and San Francesco, all casemated; the first and last very deficient in light and air, and ill adapted for maintenance of health in a Mediterranean climate. The battalion

* In the *United Service Magazine* for March 1870, on "Soldiers' Dormitories,' it is shown, p. 413, that until 1792 barracks might be said not to have an existence, "soldiers being principally billeted on the inhabitants." "In consequence of pros-"pects of war a considerable impetus was given, so that in that year and the eight "immmediately following, over nine millions of money were expended in their "construction." "It was not until 1830 that bedsteads were introduced as neces-"sary articles of barrack furniture."

† The occasional chronicity of Egyptian ophthalmia from the supervention of "granular lids," is highly suggestive of a prior follicular element, the severe inflammation being engrafted on it (equally as seen at the present day) effecting its direct ravages, its indirect chronic sequelæ depending on the anterior "grey granulations."

suffered severely from ardent continued fever,* and in March 1861, was transferred to the Valletta district, with head-quarters at Floriana and detachments partly in permanent barracks (Strade Torre) and partly in huts (Ravelin and Horn Work). As regards sanitation, the Floriana Barrack (7 companies) might well be classed under the same category as those previously occupied. Originally a storehouse, casemated and situated for security in the fortification wall, the atmosphere was damp, and utterly incapable of being renovated; gloomy, from inability of light to penetrate from without; an improvement was effected by piercing the fortification wall and formation of windows. Under these ameliorated conditions the battalion was in June 1863, when a careful inspection was made of the eyes of the men as previously detailed†, the objects being to detect and note any departure from the healthy state which the conjunctivæ of the lids might betray for future reference, and to illustrate, if possible, the natural history of follicular disease and its relation to chronic ophthalmia, granular lids—a prior immunity from these diseases, and their prospective prevalence in the face of a lengthened service in Malta, suggesting a probability of obtaining accurate data for the clearing up of debateable points. This inspection demonstrated a general diffusion of "grey granulations" in what to ordinary observation appeared healthy lids, the lesion varying in extent and severity in different segments of the battalion, very prevalent among the occupants of the larger barrack-rooms, all but absent among the serjeants and married families, and intimately associated with hygienic deficiencies. Of the descriptive details of the lesion, its stages, the individual susceptibility and grades of severity in relation to age, and accompanying symptoms, it is not necessary to recapitulate here, having been fully entered upon in the paper above referred to. A further inspection of the men in December 1864 and in January 1865, an interval of 18 months, showed that during the occupation of Floriana Barracks, with its sanitary reforms and hut life in the outworks, a marked improvement had ensued, expressed by a restoration to two-thirds of men to average healthy lids, and foreshadowed by an atrophied condition of the follicles in many at the previous inspections, with the exception of one company, sufficiently explained by the very impure damp air characterising the room occupied. While the majority of the men previously affected displayed either a latency or retrogression of the morbid follicles with an atmospheric deterioration expressed by rather more than twice the amount of carbonic acid with an excess of humidity, this company indicated growth of the lesion in barrack air in a Mediterranean climate with 1·5 per 1,000 of carbonic acid, and relative humidity 90. Corroborating the deduction of the main cause of the extensive follicular disease in 1863 being due to the hygienic defects under which the battalion was placed during the first year's service in Malta in the Cottonera district was the sequence of events upon a return to these same quarters in March 1865, and although the fostering agency of barrack atmosphere was modified by a tent encampment of several of the companies during the cholera epidemic, and the deleterious results further diminished during the year 1865–66, in contrast to 1860-61, by a decrease of numerical strength and sanitary improvements effected in the interim, yet the impetus then given to follicular growth received a full exponent under the rude atmospheric vicissitudes of a New Brunswick climate in the year following.

As before remarked, at the end of 1864 these "sago grain bodies" were in a quiescent or retrogressive state in two-thirds of the afflicted men of 1863 with decreased severity, and although in many instances either their atrophied remains, or a somewhat villous conjunctiva at the outer canthus of the lower lid, indicated their prior existence, yet the tendency towards a healthy reinstation of the lid structures was strongly marked during the latter portion of the occupation of Floriana Barracks and huts, with the exception of K Company, under the conditions previously detailed. The companies most deteriorated in 1865 were in order of severity, K, A, C, F, G.; the least, I, B, H; the maximum 33 per cent., against a minimum of 5. On change of quarters

* "The first summer the men were confined to barracks at midday, subsequently "discontinued with the best possible results."—Annual Report of Surgeon-Major Adams, 1st Battalion 22nd Regiment.

† Army Medical Report for 1863, p. 494.

A, B, C, D were located at Polverista, E, F, G, H at Isola Gate ; I, K, band and drums at San Francesco. It is unnecessary to enter into any lengthened description of these barracks,* suffice it to say that at Polverista, although the small rooms are deficient in ventilation, yet this is somewhat counterbalanced by the advantages of light and freedom from all surrounding buildings intercepting air, the barrack being situated high up in the outer fortification wall, a large open glacis in front and the country behind. At San Francesco are centered sanitary grievances, the atmosphere in its casemated rooms being dark, damp, and stagnant, superadded to its position in a crowded dirty neighbourhood. At Isola Gate the conditions are intermediate, the casemated rooms have a large window in the fortification wall opposed at the end of room by a large door, and as the windows are above the level of the adjacent houses, a current of fresh air, amounting to draught, an ascribed cause of several cases of ophthalmia, may be said to have existed when the wind was favourable, yet under ordinary circumstances, and on account of the elongated shape of the room, the light was defective and the ventilation unsatisfactory. The battalion occupied these barracks one year, there was no overcrowding, but during the summer D, E, G, and subsequently H, I, K, and part of C, were encamped on the glacis; the convalescents from ophthalmia were also rigidly excluded in a separate barrack and tent from all possible contamination of others directly or indirectly. At the end of March 1866, prior to embarkation, an examination of the lids was instituted with the following results, as compared with the condition existent in December 1864 and January 1865. Companies K, I, band and drums much deteriorated, with scarcely a single man free from morbid lesion of the conjunctival membrane, especially K ; the condition of the lids in many were fast merging into granular, in fact, in some of the younger members of the band this disease actually existed, entirely free of all engrafted inflammation, composed of morbid hypertrophied follicles resembling hemispheres of opaque firm jelly in rows studding the lower lid, with great vascularity and gelatinous infiltration of the conjunctiva, and papillary enlargement of the canthus of upper lid and along the upper edge of its tarsal cartilage. A Company was in much the same state as in 1864 ; B, C, D, E, and G slightly improved ; F presenting many cases of relaxed conjunctivæ—convalescent ophthalmia ; and H still retaining the minimum percentage of affected. Thus the San Francesco section fully substantiated the influence of grave hygienic barrack defects in spite of a temporary evacuation during the summer, the other sections remaining in *statu quo*, with the exception of a slight improvement in those enjoying a long encampment on the glacis.

During the service in Malta in two series of quarters, the last year's occupation the same as on arrival in the island, the battalion having enjoyed a prior immunity from all ophthalmia, demonstrated a strange fluctuation in the follicular disease of the lids ; a general diffusion and origin, succeeded by a retrogression on change of quarters diversified by variations in companies in sequence to sanitary defects, and followed by a stability in the majority of the afflicted and a marked exacerbation in one segment on a return after four years to the barracks first occupied, improved during the interval, yet presenting in a modified form the conditions under which the disease originated and sprung into proportions potent for evil, as exemplified by ophthalmic admissions.

In March 1866 the battalion left Malta, and in the month following was quartered in Fredericton, New Brunswick, remaining until May 1869, when it returned to Ireland. During these three years in a North American climate the companies were broken up in three barracks, two permanent, one temporary, the former, one stone, one wooden ; the latter, a large wooden building (the exhibition), designated for the purpose its name indicates, and furnishing ample accommodation for seven companies. There was no overcrowding ; the permanent barracks had little to object to as to light, ventilation, and purity of atmosphere. In the Exhibition the main fault consisted rather in an excess than a deficiency of ventilation, owing to the general slight construction of

* The features of Maltese service (barracks) are thus summed up by Dr. Parkes: —"This appears to be a dry climate ; the condition of Malta is parallel to Gibraltar "(p. 533, 'Practical Hygiene') *i.e.*, more than half the garrison is in casemates, which "are mere receptacles of foul air—damp, dark, and unwholesome." (p. 528.)

building. As a summary it may be stated that the indoor and outdoor conditions under which the men were placed in New Brunswick were inimical to the production and growth of any disease of a miasmatic character. It would be difficult to surpass the health-giving quality of the climate, in every respect the opponent of the Mediterranean; the dry cold of the long winter, with an occasional minimum of 25° below zero, arresting all organic change; the short, rapid, high, equable temperature of summer, with moderate humidity, after the prolonged duration of ice and snow, wooing the individual to an open air existence and the flooding of the dwelling with light and ventilation. As an exponent of three years' residence under the circumstances stated are the data derived from an inspection of the regiment in April 1869 prior to embarkation. Of 435 men present who had served in Malta, a percentage of 33 was characterized by a more or less abnormal state of the lids, 25 of which consisted of follicular disease unmodified by inflammatory action, and 8 associated with varying degrees of morbid thickening and vascularity of tissues, the sequel of severe engrafted ophthalmia.

Analysing the 25 per cent., demonstrating what may be termed the natural history of follicular disease, we find that in 2·5 only the grey granulations were numerous, showing no indication of retrogression; in 10·5 they were sparsely present, generally limited to the outer canthus, and often associated with slight vascularity and roughness of conjunctival membrane; in 12 per cent. atrophy had ensued, probably permanent in its nature.

Of this section of the battalion no individual in 69 presented grey granulations who had indicated a prior immunity in Malta, and the relative percentages, as above expressed, point to a condition of circumstances antagonistic to follicular development, the general tendency being retrogressive, but often associated with permanency of atrophied follicular elements. It was only in the 2·5 per cent. that the disease could be said to be active, presenting the same features so generally met with in the same body of men in 1866, expressive of vitality and suggestive of growth and development under favouring conditions; in the 10·5 per cent. various degrees and modifications of retrogression are incuded, the follicular enlargement in the majority limited to the outer canthus, the remainder of the conjunctiva healthy; in some a few isolated, irregularly scattered grey granulations occupied the lower lid, either separately or in groups, those intermediate having disappeared; in others, slight roughness of the conjunctiva (hypertrophied papillæ) was the only evidence of their prior existence:—while these 10·5 per cent. indicated approaching healthy lids, the 12 per cent. demonstrated passive degenerative products, probably permanent. Beyond a slight roughness and occasional tortuous enlarged vessels of the palpebral conjunctiva, frequently associated with calcareous degeneration of the cell elements of follicles, I could detect no change in the membrane of retrogressed follicular disease unaccompanied by inflammatory action.

It is difficult to elucidate the agencies in operation in maintaining in activity the 2·5 per cent. in view of the general tendency to retrogression, as well as, owing to the frequent interchange between one company and another, it is impossible with any accuracy to institute a comparison of their present and previous condition illustrative of phases of the structural lesion; yet by contrasting the percentage of afflicted to gradations of age and degrees of severity in 1869 with the same in 1863 certain deductions are arrived at.

ANALYSIS in 1869..

Gradations of Age.	Number Examined.	Number Affected.	Percentage Affected.	Granulations Numerous.	Few and Retrogressive.	Degeneration.
Below 15	1	..	..	..	..	..
From 15–19 ..	2	..	..	..	..	..
„ 20–24 ..	25	10	40	..	70 per cent.	30 per cent.
„ 25–29 ..	173	47	27	8 per cent.	55 „	36 „
„ 30–34 ..	137	33	24	15 „	36 „	48 „
„ 35–39 ..	47	13	27	7 „	15 „	77 „
„ 40–44 ..	11	5	45	..	..	100 „
„ 45–49 ..	2	1	50	..	..	100 „

In 1863 the tendency of the conjunctival follicles to morbid cell proliferation under exciting agencies in ratio to the rapidity of growth and development of the tissues of body generally, as exemplified by the high percentage of the affected, and severity of the cases during the earlier years, was clearly indicated, and, although in 1869 the same periods are characterized by a proportionate excess in number, yet the proneness to restoration of normal lid structures in obedience to the same law under favouring circumstances is not the less apparent, as exemplified by the slight degree of severity and small proportion of permanent degeneracy during the quinquennial period 20–24, especially when it be remembered that during these years in 1869 are for the major part included the proportionate excess in numbers and severity in 1863. Taking the years 30–34 as a neutral ground, characterized by a tardiness of structural change, whether as regards development or retrogression, the earlier years are expressive of involution of the hypertrophied follicles terminating in normal conjunctiva, the later of atrophy and permanency of the degenerated elements,* semi-cartilaginous in appearance or calcareous, the progressive tendency to which with advancing age is apparent, the latter form predominating.

Thus it is clear that, while the six years of service in Malta and the conditions there accruing may be regarded as the period of origin and maturity of the "grey granulations" in the battalion, the three years' residence in New Brunswick witnessed the decline.

Markedly distinct from that portion of the battalion which may be designated as the Malta segment and above narrated, was the segment composed of the various drafts from the depôt during the North American service. On joining head-quarters, between 1866-68, a percentage of 47 had "follicular "disease," and on carefully examining them in 1869 the degree of severity was as follows:—63 per cent. moderate, 22 severe, 15 atrophied. The contrast between this segment, much resembling the state of those in Malta in 1863, and the condition of the latter in 1869 merging on recovery, was very apparent. The follicular disease had much improved since residence in New Brunswick, but had produced 29 severe attacks of ophthalmia.

Origin of Follicular Granulations.—The accumulation of independent observations points conclusively to the grey granulations having their primary origin in the solitary follicles of Krausse, morbidly hypertrophied from hyperplasia of their elementary constituents, microscopic inquiry having demonstrated their existence as normal histological components of the conjunctivæ both of men† and animals. Independent, however, of this latter testimony, the pathological phases,—their gradual development, oft for a long time maintaining their individuality and isolation from the surrounding conjunctival structures, the defined system of lid involvement and limitation to a certain

* In this case the degenerated follicles were invariably limited to the lower lid, the upper presenting in the majority a perfectly healthy conjunctiva.

† For full details of the anatomy of the human conjunctiva, as well as accurate coloured delineation of the naked eye aspect of severe follicular disease and microscopic drawings, *see* Marston on Ophthalmia: "Beale's Archives of Medicine," 1862.

area*, their distinct course of retrogression,—substantiate their position as normal, physiological organs, leaving the *modus operandi* of morbid agency an open question.

Exciting Cause of Follicular Hypertropy.—The independent testimony of continental inquirers,† and Frank and Marston of the Medical Department of the British Army, the general deductions from the yearly Reports of the Army as a whole, and the observed phenomena in the 1st Battalion 22nd Regiment, furnish an indubitable authentic causation in hygienic deficiencies, man and animals indicating the like phenomena under like surroundings. The fostering conditions may be defined as the vitiations of the dwelling-air accruing from the accumulation of the impalpable excreta of the breath, skin, and body generally, consequent on an absence or incompleteness of ventilation, and modified by light, heat, and moisture of the atmosphere. As a deduction from a number of observations an impurity represented by 1·5 per 1,000 of carbonic acid would furnish a nidus, provided great warmth and moisture be component associates. The necessity of these latter is unquestionable, and although in general terms the atmospheric deterioration may be expressed in the amount of carbonic acid‡, any method which would determine the proportion of organic animal matter in the air from body effluvia and its tendency to stability or decomposition (for this the sense of smell is no mean analyser) would indicate with greater certainty the deleterious results to be apprehended than a mere chemical formula. The decomposing animal excreta, in fact, would appear to be the excitant in the proliferation of the cell elements. Such a condition must be in the ascendancy during the night, when, for the sake of warmth in the sleeping apartment, the tendency to exclude fresh air is all powerful, and when a number of individuals are collected together to accumulate their exhalations in one common reservoir; the too often damp, badly lighted, overcrowded, ill ventilated resorts of poverty furnish the requisite concomitants, to be intensified by the heat and moisture of climate, or diminished by its cold or dryness. It is clear that it is impossible to limit follicular disease to this or that country, springing up wherever the necessary conditions for its production exist, showing a predilection for hot climates from the average high temperature developing the essentials more quickly and to a greater extent than more northern countries, but in all originating under like concomitants, limited to the lower class of society, and exercising its baneful influence more especially upon those members of the limited community compelled by occupation or age to pass the greater part of the day in the vitiated atmosphere of the dwelling. The poorer segment of the populace in Ireland, whether inhabiting the wretched tenement in the overcrowded slums

* Marston, Wells and others have suggested an actual neo-plastic formation of gland substance under inflammatory action, to account for their presumed excess and position in disease as compared with health. I cannot but think, however, that more extended observation will show that other pathological elements, the products of chronic inflammation, have been confounded with them in the general coalescence consequent on continued morbid action in the conjunctival tissues.

† Beyond that adduced by German surgeons, and especially Stromeyer, as detailed by Staff Assistant-Surgeon Frank in "Army Medical Report for 1860," is a good illustration by Surgeon Marques, of the Portuguese Army, narrated in the "Medico-Chirurgical Review," April 1863, p. 400:—"The community of Casal Pia, "some hundreds of boys and girls who inhabit the dark and sombre edifice of "Destero, at Lisbon, much filth in its vicinity, no eye complaints among the "neighbours, the disease has clung to the inmates for 23 years in spite of all "attempts to curtail its ravages, and originated in the soldiers subsequently "occupying it."

‡ It appears beyond a doubt that the ratio of carbonic acid and the organic matter is not constant. The observations of Dr. A. Smith, as recorded in "Medical Times and Gazette," Nov. 20–27, 1869, indicate "that the evils of ill-ventilation "arise not from accumulation of carbonic acid, but from the discharge of some "kind of organic matter into the atmosphere;" but, although "an increase of car-"bonic acid is associated with this organic matter, and consequently may be "employed as a sign of pollution," yet the origin, nature, and condition of the deleterious elements remain unexplained; one of the chemical products of decomposed organic particles is determined, while their presence in a vital potential form remains undemonstrated.

of the town or the country cabin, shared alike by humanity, fowls, pigs, and dogs, in its aged "blear eye," unable to face the light of heaven, the corneal opacities of middle and adult age, the acute ophthalmia of youth, and follicular lesion of the younger branches, will illustrate each phase of the malady equally with the Italian "lazzaroni" and the denizens of the underground habitations in the populous cities of the Mediterranean, or wherever poverty and its associates are rife.

An important question, however, arises—are these morbidly enlarged follicles always to be regarded as solely dependent on miasmatic causes? That they may originate under long-continued exposure to dust or external irritants of like nature, associated with an injected roughened conjunctiva, as an occasional sequel to prolonged inflammatory action* (in this case eventuating in as stubborn a disease as when primarily present), or may be detected from time to time in lids apparently independent of the two former conditions, and where no malarious influence could be assigned as the agent, cannot be questioned; the rarity however, with which they are associated forbid them being regarded in any but the light of an occasional coincidence, and probably dependent on constitutional predisposition to glandular derangement on the part of the individual. Their endemic prevalence, their independence of prior hyperæmia or ophthalmia, their gradual development into mature tissue structures prone to permanence or slow in change, not their isolated occurrence, are the points at issue; and the co-existence of these on a large scale both in man and animals with miasm is too overwhelming for any rational doubt.

The frequency with which epithelial and pus cells have been detected in the atmosphere surrounding patients with conjunctival disease would also suggest the question—Are not these grey granulations dependent on such an origin? Without denying the possibility of such agency, adding no doubt when decomposing to the vitiation of atmosphere, and thus tending to produce the necessary nidus, especially if extended over a lengthened period, their development under conditions entirely opposed to such an explanation would render it highly improbable, especially when it be remembered how seldom the necessary concomitants could ensue in the British Army under the existing regulations of the present day.† The data of the 1st Battalion 22nd Regiment negative their dependence on any specific (or otherwise) conjunctival emanation, and the acme of ophthalmia attacks was coincident with their commencing decline.

Phenomena characterizing their Presence.—It would appear that these meretricious elements vary in the degree of predisposition to ophthalmia they engender in ratio to their stage of growth and maturity. During the earliest stage, slight conjunctivitis, probably excited by the active cell proliferation in the follicles, are very common; as they advance, a certain tolerance of their presence is observed, and provided the surrounding hygienic defects are such as to maintain them in a mature state, or foster further development, any inflammatory attack engrafted on them is proportionately more severe in character and intractable; in their retrogessive stage, while the tendency to disease diminishes, yet the superadded conjunctivitis consequent upon the thickening and vascularity of the surrounding tissues is invariably chronic; when permanent from calcareous or fibroid degeneration, their influence appears limited in the former to occasionally maintaining an irritable state of the eye from their surface roughness.

The objective features characterizing the period of growth and maturity of the grey granulations are a smoothness and tenseness of outline, glistening

* The structural identity of these follicles with the closed follicles of the intestines was pointed out as early as 1860 by Staff Assistant-Surgeon Frank. Glands in nowise to be discriminated from them can be observed studding the upper part of throat and pharynx occasionally in chronic disease of the tonsils. Judging from analogy and pathology, is it to be wondered at that those studding the conjunctiva should betray an occasional hypertrophy not to be classified under ordinary causation equally with their congeners elsewhere?

† I have carefully sought after evidence of such origin in patients and orderlies constantly in the atmosphere of ophthalmia, and have never found substantiating proofs.

semi-transparency of the mass, and progressive increase in size with accompanying hyperæmia and tissue proliferation of the conjunctiva, increased meibomian secretion, mucus and tears; while irregularity and indistinctness of outline, opacity of cellular elements, withering of the mass, with tendency to smoothness and normal thinness of the membrane as clearly indicate their retrogression.

Occasionally, under favouring circumstances, an arrest of the involution is to be met with, generally in individuals over 30 or 35 years of age; the follicles mature but few, and limited to the outer canthus of the lower lid, and apparently innocuous in character. The frequent instances in soldiers under good sanitation and free from all ophthalmia have led some to question their ascribed cause and importance. The explanation I believe is this—that the potency of the granulations is mainly limited to the stages of development and maturity—to the period of active cell proliferation, and that in the instances stated from no definable reason beyond that of comparative stability of structure characterizing the age of the individuals in which they generally are seen, the presence of favouring circumstances neither determines their involution and disappearance, as in earlier years, nor their degeneration, as in later, but a tissue permanency ensues which, as it is unaccompanied by morbid activity, seems also inert in consequences.

The facts previously recorded illustrate a development of the follicles under equal conditions most progressive in youth, from 73 per cent. between 15 and 19 years of age, to 35 per cent. between 40 and 44, their retrogression following the same law; and that while an exposure to the exciting causes, spread over months, and probably averaging one year, was necessary for effecting their origin and general prevalence, their disappearance was not to be compassed but by a continuance of good sanitation for at least twice that duration.

Presence of the Lesion among Recruits.—But while acknowledging the *fons mali* to be the vitiated barrack atmosphere, especially of certain foreign stations, a point not to be lost sight of is the condition of the lids of the recruits entering the Service, an exponent of the immediate domestic surroundings of the class from which they are drawn. From 1861–67, 39·2 per 1,000 of the total rejections of recruits in the United Kingdom are classified under "diseases of the eye and eyelids," and during 1861–63 the respective proportions were 34·9 per 1,000 among recruits in England, 17·5 in Scotland, and 40·4 in Ireland. There cannot be a fraction of doubt that this large proportion represents no mean quantity of follicular disease, or granular lids. For example, between 1866–68 separate drafts of recruits from the depôt joined the headquarters of the 1st Battalion 22nd Regiment in New Brunswick. Of 247 of these men carefully inspected on arrival, 47 per cent. had "grey granulations" in their lids, the major part being in a state of activity, a few presenting merely the atrophied remains, while two had complete obliteration of the lachrymal sac on one side, with extreme vascularity and roughness of the conjunctivæ, and two were "blear-eyed," with loss of eyelashes, the sequelæ of old disease prior to enlistment. From the extreme variability of the condition of the follicles among the affected men who had passed equal service at the depôt, the remarkable contrast in the healthy aspect of others, and the presence of atrophy in a few, the evident conclusion was the existence of the lesion anterior to entry in the Service. Two facts stand clear: (1) the presence of the germs of granular lids among the class from which recruits are drawn; (2) a certain percentage (by no means small) in those received into the Army, too frequently to undergo without loss of time the fostering agency of barrack surroundings.

Ophthalmia in the 1st Battalion 22nd Regiment.—Prior to the arrival of the 1st Battalion 22nd Regiment in Malta no form of ophthalmia had been in existence for at least 20 years. From June 1860 to the end of 1862 it was noted that a marked increase had ensued as compared with the statistics anterior to the Maltese service, amounting to 90 cases, but the disease was mild, easily cured, left no chronic changes, and was followed by few relapses. What the exact nature of the conjunctivitis was is questionable. According to Surgeon-Major Adams, 1st Battalion 22nd Regiment, "it might fairly be "classified under simple conjunctivitis, and with much semblance of truth "have claimed dust or solar radiation as its cause." How far it might have

been due to commencing follicular hypertrophy, which was extremely rife in 1863, is obscure, but the natural history of the "grey granulations" and the quartering of the battalion in badly ventilated and defective barracks, the same under which the disease reappeared in 1865, render it highly probable that many of the attacks in 1861* and 1862 acknowledged such a predisposition and or gin. "During September of 1861 (in this respect coinciding with the "popular idea of prevalence about the autumnal equinox) an epidemic of "ophthalmia occurred among the children of the soldiers' families located in "huts at one of the outworks exposed very much to the sun and weather; it "was noted that the disease spread rapidly in families and was intensely "communicable; no chronic changes ensued."† The officers were free from any form of the disease during the period embraced.

From June 1863 all doubt disappears as to the relation of grey granulations and ophthalmia, consequent on the data derived from careful inspections and detailed elsewhere.‡ From January 1863 to March 1866 (the termination of Maltese service) 119 admissions into hospital occurred from ophthalmia (not representing the actual extent of disease, inasmuch as numerous slight cases, especially in the latter part of 1865 and 1866, were treated outside), and from the latter date to December 1868 (New Brunswick service) 117, of which 83 were in men from Malta, and 34 among recruits; the acme of the disease being in 1866, subsequent to arrival in North America, 59 cases occurring during the last nine months, with only 8 cases during the first three months in Malta. The relative prevalence of the disease during the individual months of each year in Malta showed an absence of all periodical coincidence;§ as contrasted with the same periods of successive years the most marked discrepancy was apparent, with no deduction to be drawn beyond a diminution of the disease during the winter months; in New Brunswick the major attacks were during the variable months marking the change of seasons. Among the Malta segment, from June 1863 to Decembe r1869, 206 admissions from ophthalmia occurred, representing 143 individuals; in the depôt segment 52, representing 33 attacks; while during the same period the officers furnished none, and the women and children 39, of which 32 were exceptional during three months of 1865, and will be detailed separately. Excluding the intruding section from the depôt, as tending to oppose accuracy in deductions drawn from the ophthalmia in relation to the follicular phases previously narrated, the statistics of the 1st Battalion 22nd Regiment furnished the following data:—

* Surgeon-Major Adams substantiated the existence of follicular disease among the men in September of this year; unfortunately no data were retained.

† Report of Surgeon-Major Adams. This outbreak is extremely interesting, and bears upon the question of etiology of follicular disease as a sequel to purulent ophthalmia, as a careful examination of the women and children in June 1863 indicated their all but complete freedom, while the men were tainted. The absence of all chronicity would show a prior healthy lid in this section of the regiment also in September 1861.

‡ "Army Medical Report," Vol. v. p. 494.

§ Popular opinion in Malta associates the exacerbations of ophthalmia and the sirocco winds. Although the statistics of the 22nd Regiment do not substantiate this statement, it cannot be questioned that the characteristic warmth and moisture of these winds must, by their relaxing tendency, augment any conjunctival vascularity and clearly predispose to any slight irritant; their effect in causing relapses (Hennen) and retarding recovery is indubitable, and explains the general idea, a relapse being invariably regarded as a fresh attack.

Year.	Admissions.	Attacks.	Proportion of Relapses.	Average Duration of Case.	Average Duration in Hospital of all other Diseases.	Proportion of Ophthalmic Attacks to all other Attacks of Disease.	Percentage of Ophthalmia in Hospital at end of each week.	Percentage of Cases under 7 days in Hospital.	Percentage of Cases beyond 31 days in Hospital.	Complications.
			Per cent.	Days.	Days.	Per cent.	Per cent.			Per cent.
1863 ...	35	31	11·5	12·3	15·27	6.1	4·1	77·4	6·4	...
1864 ...	20	16	20·	22·6	13·70	4·9	10·7	43·7	18·7	5
1865 ...	56	36	35·7	33·3	14·84	13·1	30·8	50·	33·2	16
1866 ...	64	41	35·8	36·4	13·04	30·2	90·	17·	41·5	20
1867 ...	16	10	37·5	57·9	14·89	9.5	42·5	10·	70.	25
1868* ...	11	6	45·5	49·	13·38	11·3	54·	16·6	66·6	33

Hence it will be observed that the attacks demonstrate the decrease in 1864 coincident with the general retrogression of the "grey granulations," the exacerbation in 1865 following their re-advance, reaching a climax in 1866 consequent on exposure of the weak lids to rigid climatic excitants in New Brunswick, succeeded by a gradual decline both in ophthalmia and follicular disease on healthy atmospheric surroundings. The augmenting severity and tendency to relapse (in two cases to a seventh time) in ratio to the duration and consequent maturity of the follicles is no less indicated, as well as the relative importance of the ophthalmia in the general sick list expressed as a proportionate percentage to all the diseases, which the progressive percentage in hospital at the end of each week, to the climax in 1866, equally substantiates as well as the advancing intractability of the malady, and strong tendency to chronicity proportionate to maturity of "vesicles"; the one disease in 1866 constituting one-third of total admissions, and preponderating most markedly in causation of inefficiency of the corps. Equally expressive of its progressive severity is the yearly advancing percentage of cases more than 31 days in hospital with the decline of those under 7; of the latter, the year 1864 corroborates the deductions from the number of attacks corresponding to decline of vesicles, leaving intact the severity of the cases occurring during that period from the maturity of the granulations as exemplified by the average duration of case, the percentage beyond 31 days in hospital, and complications. The tendency for these latter to ensue in proportion to the chronicity of the cases is apparent, a relapse being more frequently associated with them than a primary attack in the proportion of 4 to 1. Permanent defects followed complications at a percentage of 48, and invaliding 29 per cent.; the actual number discharged the service being 9, or in proportion to admission 4·4 per cent.

Of 176 primary attacks of all conjunctival lesions admitted into hospital from 1863 to 1869, 143 had clear follicular disease as a primary element—a ratio of 81·2 per cent.; in 17, or 9·7 per cent., the lids were healthy; in 16, or 9·1 per cent., the previous condition was doubtful (*i. e.*, not certified to in note-book, but not excluding the possibility of vesicles). While the average number of days in hospital from all ophthalmia was 35·2, the non-follicular was 12·3; 89 per cent. of relapses had follicles; 4·5 per cent. not.

Among these attacks no discrimination is made between the different varieties of conjunctival lesion, whether simple conjunctivitis, catarrhal, purulent, or granular, or as to causation; the proportionate dependence upon the follicles as a predisposing agent and productive of chronicity being, clearly demonstrated. Nothing, however, has tended so much to mysterize the disease and to retard the elucidation of its etiology and pathology as the amalgamation of all conjunctivæ to which the soldier is liable under the one term "military or granular ophthalmia," as varieties of one specific form; the denial by some of the very existence of the grey granulations following, because that, forsooth, every case irrespective of causation cannot be brought under the same category, cannot indubitably exemplify their invariable presence as a primary element in the inflammatory attack. That the soldier is liable, in common with every individual of the community at large, to either of the distinct forms of conjunctival lesion of authors when exposed to usual causa-

* 1869 is not included, inasmuch as only four admissions occurred during the year from this segment.

tion is evident, and probably to a greater extent, inasmuch as the variations of climate and soil to which he is subjected on service, especially foreign, frequently exemplifying the ascribed causes in an intense degree, as well as that, common also with isolated segments of the community, he betrays a like follicular hypertrophy, potent for chronic disease, when exposed to similar miasmatic agencies. The more or less endemicity of grey granulations and its associated ophthalmia does not exclude the occurrence of ordinary catarrhal or purulent forms in healthy lids of the same community when exposed to the usual agencies, and moreover there is the secretion from granular ophthalmia, when endemic, always present (provided the strictest quarantine be not enforced) to assert its influence indiscriminately on follicular or healthy lids, hence the necessity of a cautious scrutiny into each case occurring, for the transferrence of it to its proper sphere of causation and right differentiation of the lesion, and consequent accurate data for prevention and eradication.

Of the 176 attacks, in 120 both eyes were primarily affected, or within three days of each other; in 31, the right eye only; in 20, the left; in 5, it commenced in one eye and extended to the other after a prolonged interval.

The relative prevalence of the ophthalmia in different segments of the battalion demonstrated that the presence of grey granulations is not necessarily followed by an inflammatory attack, and that the ratio of their prevalence is not always coincident with the admissions, so much depending on individual exposure to exciting agencies, but the latter operating on all with like intensity, the frequency of the conjuctival lesion will follow *pari passu* the diffusion of the grey granulations; *e. g.*, on transferrence of the regiment to New Brunswick, with its general climatic rigors, Companies B and H, with fewest instances of follicular disease, produced ophthalmic admissions 1·3 per cent. of strength; I, K, and Band, the worst, gave 14 per cent., with numerous slight cases treated out of hospital; the intermediate companies gave 6·6 per cent of cases.

Relations of Ophthalmia to Grey Granulations.—The dependence of the granular ophthalmia upon prior follicular disease* being indubitable, the question arises, in what relation do they stand? That these follicles may, under favourable conditions, so become developed and associated with hypertrophy of the papilla of the conjunctiva, entirely independent of such inflammatory action as is cognizant to the observer by the usual objective symptoms, as to be in no way differentiated from the granular lids as a sequel to engrafted conjunctivitis, I have before stated,† and from my own observations, substantiated by unshaken evidence, it would appear that such a phase of the process is not uncommon where the surrounding conditions are uniform and free from external exciting climatic agencies, such as prevail in the underground cellars of the poor Maltese.‡ However, these are not the phenomena characterizing the daily life of the soldier. A forced exposure, day and night, wind and wet, dust or sunshine, hot guard-room and cold "sentry-go," engraft inflammation upon his predisposed lids with a severity out of all proportion to what the ascribed cause would have produced in a prior healthy conjunctiva. The character of the induced inflammation varied extremely, from simple conjunctivitis in the early cases to slight catarrhal or catarrho-purulent in the later, and dependent less on the nature of the exciting cause§ than the stage of development of the

* A strong analogy between grey granulations of the conjunctiva and miliary tubercles of the lung may be detected. Primary elements of disease, originating frequently under like conditions and presenting a great resemblance in morbid anatomical constituents, each may demonstrate the same retrogression, and leave the evidence of their prior existence in degenerate particles; or, developing, may predispose to from slight causes, or actuate *per se*, inflammatory process in the surrounding tissues, blending the products in one confused mass with deterioration, if not destruction of the normal histological elements.

† "Army Medical Report for 1863," p. 495.

‡ In these families every gradation of the disease can be seen, from the discrete follicles of the younger with no vascularity, to their hypertrophy in the elder children with general tumefaction, on to the granular lids of the adolescent, and "blear "eyes," or corneal opacities of the adult.

§ It would appear certain that any external agent capable of acting as an irritant to the mucous membrane, no matter its nature, will induce inflammatory action in grey granulation lids, producing varied forms of conjunctivitis according to the degree of prior lid derangement.

grey granulations, one feature only being constant—the excessive involvement of the palpebral tissues in comparison to the ocular conjunctiva. In the slighter cases all morbid action was limited essentially to the eyelids, involving in decreasing degrees of severity the sinus and sclerotic reflexion; at the commencement of the superadded inflammation, the lower lid was invariably more involved than the upper; in some it was entirely limited to the former and the inferior segment of the sclerotic conjunctiva, the chemosis and vascularity not extending above a line drawn from one to the other canthus. While the nature of the engrafted inflammation from ordinary excitants varied from simple conjunctivitis to slight purulent, it must be remembered that the membrane was not exempt from the usual causations of the severer ophthalmiæ, demonstrating under these circumstances the intensity of the specific inflammation with the subsequent chronicity of the grey granulations.

Pathology and Morbid Anatomy.—The pathological condition above narrated is easily understood when we consider that in these cases prior to inflammation as a strong modifying factor, there are in existence not only the grey granulations studding the lower lid, but consequent on their presence and the developmental phase of which they are the seat, frequently also hypertrophy of the conjunctival tissue, especially the papillæ of the upper lid at each canthus and along the line of the upper edge of the tarsal cartilage, so that, on everting the upper lid, even within two or three days of the commencement of the inflammatory attack, granulations (hypertrophied papillæ) are already developed; in fact, the hyperplasia of inflammation has merely rapidly advanced what would have gradually been brought about by continued follicular cell proliferation in the lower lid.

Carefully watching the inflammatory phase a marked distinction will be observed in the morbid anatomical elements of the conjunctival tissues of the upper and lower lid. How far these are dependent on the histological constituents, the limitation of the closed follicles to the lower lid, or the excess of papillæ in the upper is questionable. The naked-eye aspect of the granulations of the lower lid, the hypertrophied follicles, is that of smooth, hemispherical, semi-transparent, firm, gelatinous-looking, pinkish structures, averaging 1-15th of an inch in diameter, situated in the sub-mucous tissue in regular linear series of about 1-5th of an inch in surface breadth from the inner to the outer canthus. Microscopically they are composed of nucleated granular cells floating in more or less thick granular fluid according to the degree of growth, surrounded by a fibrous tissue cell stroma, the thickened glandular enveloping membrane which, on further morbid action, merges into the neighbouring structures. The conjunctiva stretches over these morbid growths which, if large, produce an atrophy of its elements, giving a lighter hue in inflammatory injection compared to that beyond. At the palpebral sinus, the exudation into the meshes of the velvety and deeply-coloured membrane is gelatinous, at the sclerotic the chemosis is more watery. On the upper lid the surface is studded over by rough, closely-packed, superficial projections of every conceivable shape and size—elements of the inflamed conjunctival tissue—invariably more advanced at each canthus and along the line of the upper tarsal edge, from which they gradually involve the lid to the per-palpebral border; pathologically they are hypertrophied papillæ. The contrast between the smooth oval globules of the lower and the rough nodules of the upper, consequent on the predominence of sub-conjunctival in the one, and surface element hypertrophy in the other, is very marked, and probably dependent on the relative proportion of the normal histological components. Prolonged morbid action obliterates these distinctions.*

From these observations the inference is, that as regards the upper lid, the

* Whether the follicles as physiological organs are more numerous in the lower lid than the upper I am unable to state; but beyond a doubt, under exciting causes, they are seen primarily limited to the former, while, on the other hand, the papillæ predominate on the latter. On the supervention of inflammation the impetus given to development no less exemplifies this distinction, but after a long-continued morbid action, the products of chronic sub-acute inflammation are so matted with the primary elements as to defy differentiation; friction also, and "melting down" of surface irregularities of the upper lid from prolonged opthalmia produces a beaded aspect approximating in appearance the lower, and assimilating both conjunctivæ to an ordinary granulating sore.

morbid anatomy differs but little from what may ensue in any conjunctival inflammation rendered from any cause sufficiently chronic in its nature—highly improbable in any prior healthy lid; and that the distinguishing feature in "granular ophthalmia" is the sub-conjunctival hypertrophied follicle as a primary element.

Diagnosis.—Proportionate to the degree of development of the grey granulations does the probability lessen of their being obscured by the injection and tumefaction of the inflamed conjunctiva. During their early growth it would be difficult or impossible to diagnose their presence in a severe ophthalmia, which however is very rare at this stage; intermediate it may be occasionally doubtful, but at a more advanced period the conjunctiva covering them is firmly bound down to their surface and atrophied, never developing papillæ, and presenting a marked contrast to the membrane at the palpebral sinus, no tumefaction can obliterate them, and consequently their existence is easily demonstrated.* However, even when obscure to the naked eye, the marked thickening of the palpebral tissues with their undue predominance of inflammation (chemosis of the sclerotic not at all common, even when the lids are œdematous), and the existence of enlarged papillæ on the upper lid at a very early stage, or even when the vascularity is mainly limited to the lower half of the eye, differentiates this disease, and renders the diagnosis easy. Other features also distinguishing it from idiopathic inflammation are the comparative less engorgement of the vessels and marked predominance of solid over the fluid constituents in the products of exudation.

Influence of the Inflammation upon the Vesicles.—On the subsidence of the tumefaction the follicles, which may have become temporarily obscured, are again apparent, increased in size, but constant in numbers†, or, if in an early stage, under the influence of inflammatory action, they may be seen to become milky white and opaque, to burst, leaving the membrane honeycombed, which regains subsequently its normal condition. Such a result is a very satisfactory termination, but appears limited to the early stage when the proportion of fluidity in the follicular mass is highest.‡ As

* Their gradual development can be watched to perfection when one eye sympathetically follows the other, unaccompanied but by the slightest tumefaction.

† It has been supposed by some that secondary glandular growth, neo-plastic products, ensues by a process of germination, and is invoked to account for their apparent excess under inflammatory action as compared to their numbers as physiological organs, and their presence, *e.g.*, cornea and sclerotic, where not normal constituents. The evidence afforded on the retrogression of inflammation does not support this opinion, and I cannot but think that the products of chronic disease have been mistaken for the grey granulation as the conjunctiva, especially of the sinuses, and occasionally of the sclerotic, after long-continued morbid action betrays a condition which undoubtedly, if not read by the light of prior phases, would support such an inference. The nature of the exudation into the conjunctival meshes is very gelatinous, and in the long run becomes semi-organized, betraying in its pathological features a great similitude to the follicular mass; however, at no time are they distinct structural components, but result from hyperplasia of the tissue elements, merging into them, and capable of production elsewhere under like action. The rapidity of their retrogression, and comparative amenability to therapeutical agents, markedly distinguish them from the grey granulations whose persistency and obduracy are explained by their origin from normal histological organs, and not mere circumscribed tissue hypertrophy from temporary abnormal conditions of nutrition. I observed in one case their presence (three in number) on the palpebral edge of one lower lid long after all subsidence of inflammation; but even here there was no clear definition from surrounding tissues into which the limited hypertrophy merged.

‡ A man of the 2nd Battalion 15th Regiment was in hospital with influenza; both lower lids studded with enlarged follicles at an early stage; "eyes generally "weak." On the lower lid of the right eye one of the meibomian glands inflame. On the corresponding part of conjunctiva much injection present which extended to the sclerotic, the follicles were milky white in this zone. On the following day those occupying the central part had burst leaving depressions in the membrane; on the next day none were discernible, but ridges of tissues intersected the spaces left, which were occupied by a whitish film. No change ensued outside the zone of hyperæmia, nor in the other eye.

regards their ultimate disposal the conditions represented by 60 cases of severe engrafted inflammation at the inspection in May 1869, may be taken as elucidatory, a period varying from 5 years to 3 months having ensued since discharge from hospital. In 37 the lower lid was uniformly thickened and vascular, with the follicular elements and products of inflammation still present, the latter, however, not preventing the clear definition of the former; the upper lid showed but a few hypertrophied shrunken papillæ at outer canthus. In 23 all disease had disappeared, leaving the lids pale and smooth, except the slight unevenness from superficial cicatrices and an occasional papilla. One, more carefully examined, *post-mortem*, presented along the upper edge of the upper tarsal cartilage a band of tissue 1-10th of an inch in breadth, slightly more vascular than the rest, glistening on its surface with thin ridges of fibrous tissue traversing it in every direction (cicatricial tissue); here and there was an isolated shrunken papilla; a few (five or six) small, opaque, puckered spots (fatty degenerated follicles) were situated in the sub-mucous tissue of the lower lids; beyond this the conjunctiva was in no way different from the normal structure.

Association of Ill-health with Grey Granulations.—Deficient stamina and ill-health, as associates of follicular ophthalmia, have been observed from time to time, but whether regarded as predisposing agencies, as dependent on the same causation, or as a sequence is not clear. The evidence of the 22nd Regiment does not substantiate the concurrence of grey granulations and deteriorated health sufficiently frequent to justify an hypothesis of a dependence of the former on the latter or *vice versâ*; the co-existence of these growths with apparently the most perfect health was frequent, as well as their occasional absence in debilitated frames; their dependence for origin on other conditions than age, sex, constitution, diathesis, or temperament, was too apparent to be overlooked. But while objecting to the elevation of defective health as a cause or necessary accompaniment of this abnormal state in the early stage, none can doubt of their association, provided the individual be left to imbibe the same pernicious atmosphere, or when, from increased development or presence of external exciting agencies, these bodies maintain a constant irritation which frequently leads the sufferer to retire from the fresh air and sunshine and seek the gloom of some retired nook. Let, however, inflammatory action be superadded, and a lengthened period of treatment necessary; see the individual at the commencement of average healthy aspect, with "nothing but a cold in his eye," to be contrasted with his blanched appearance at his exit, perhaps after months of hospital confinement, his thinned face, depressed countenance, and local defects of the malady! The inability to obtain amusement from books, the morbid frame of mind into which the individual falls from mental concentration on the malady; the want of appetite from deficient exercise, and consequent loss of strength, muscular development and vigour; the etiolated countenance from exclusion of light; all tell on the sufferer's constitution, independent of the actual local subjective symptoms of the lesion, and render it one of the most important points in the treatment how to prevent the wear and tear of mind and body, how to retain a healthy stamina of system compatible with the restraint necessary to effect a normal restoration of the diseased lids and prevent complications.

Subjective Symptoms.—Of the subjective symptoms associated with the early stage of this ophthalmia but little need be said. Pain (except after use of the eye) or photophobia were rarely present, the roughness and heavy feeling of the lids, the glueing together at night, and the discharge (generally slight and watery) were inconvenient, but seldom amounted to an actual complaint; the objective phenomena were the features inducing the individual to seek relief.

Complications.—In reference to the complications, or secondary lesions, to which the tissues of the eye were liable, in contradistinction to the direct result of the engrafted conjunctivitis, it may be stated that in no case did any ensue within 30 days' duration of the inflammation, in the majority postponed beyond six weeks; the probability of such being in direct ratio to the duration of the disease, and consequently more frequent in relapses. As has been before remarked, the severity of the conjunctivitis was concentrated on the palpebral tissues, always in excess as compared with the involvement of

the sclerotic reflexion; chemosis was rarely present to any extent, and only excessive in two cases, in both of which complete corneal opacity, with threatened sloughing, was the direct result of the severity of the inflammation,* the sole instances of primary involvement of the tunics proper of the eyeball. Early impairment of the tissues of the globe being of such rare occurrence, it becomes an important matter to elucidate the causation of the secondary lesions, supervening when much of the inflammatory vascularity, and especially that of the sclerotic, has subsided. Their all but invariable commencement in, and frequent limitation to, the upper section of the cornea† normally swept by the upper lid, their dependence on chronicity, with firm, rough, hypertrophied papillæ, and the evidence of treatment, determine their causation in the mechanical irritation of the granulations on the opposing surface of the lids. The necessity of educing the true causation of these lesions for the application of rational therapeutical measures is apparent, when it be remembered that in the majority of cases it is by a gradual involvement of the cornea, and subsequent implication of the deeper tissues, that partial or total impairment of vision, or even destruction of the eyeball is effected.

Photophobia, lachrymation, optical and circumorbital pain, previously absent, were the subjective symptoms indicative of a corneal involvement, and the palpebral roughness, mechanically irritating as movement of the eye caused friction on the cornea, was a great subject of complaint.

The most frequent corneal derangement consisted in a tumefaction of its coats, gradually progressing from the circumference to the centre. At first, the cornea was clear and transparent, but its surface was uneven and apparently nodulated, reflecting the light as from numerous different facets; subsequently the nodules became opaque (the disease at this degree very much resembling a premature arcus senilis), and numerous straight vessels proceeded from the sclerotic into the morbid zone. According to the progress of the complication this process was gradually extended, implicating section after section of the upper half of the cornea, or even its entire surface, producing, in its extreme degree, pannus. This lesion, slow in its operation, consisting in hyperplasia of the deeper corneal elements, was not uncommon after two months' duration of the disease, its extent various, and generally not productive of impaired vision after recovery from non-implication of the zone for transmission of rays of light. In no case was it associated with destruction of tissue, or active change in other tunics of the eye, but relapses were numerous.

Ulceration of the cornea was next in order of frequency, usually one, oval, sharp cut, and accompanied by one or more vessels, passing to it from the sclerotic. The seat of the ulcer was nearer the centre than the circumference of the cornea, and invariably in the upper half. In one case perforation occurred with staphyloma and collapse of globe.

Less frequently did corneitis ensue with effusion between, and separation of the coats, usually retaining much transparency. The conjunctival layer especially was thrown into folds and puckered, and on healing leaving a diffused haziness. Sloughing did not result, although its probability highly suggested itself. In two cases this lesion extended over a portion of the cornea rather larger than a split pea, near the outer circumference of the upper segment, and corresponded to a persistent patch of granulations near the outer canthus.

Occasionally a phlyctenula was observed, and in two cases small scattered patches of opaque exudation in the deep structure ensued over the upper half of the cornea. In six cases inflammatory action advanced beyond the cornea to the posterior tunics, producing in all very great defects of vision.

The progressive sectional vascularity and opacity, the most frequent complication, was extremely liable to return on the slightest relapse of the palpebral disease; ulceration and corneitis were invariably attended by great photo-

* In one of these there is every reason to believe that the transferrence of gonorrhœal matter to the eye was the cause of the engrafted inflammation.

† In only one case did the involvement start from the circumference of the lower segment of the cornea; here the lower lid, which ordinarily in the open eye covers no portion of that tunic, was in contact with its surface equally with the upper.

phobia and intense circumorbital pain, and produced the greatest number of permanent defects; the involment of the posterior tunics occurred only after a very lengthened period; in two instances morbid interference with the nutrition of the eyeball (independent of complications above narrated) ensued, as evinced by softnes of the globe;* and in one the movements of the eye, especially in an outward direction, were curtailed.

Of the lesions remaining in the lids, the most common, and a very frequent one, was the conjunctival roughness, vascularity, and tissue hypertrophy, with a great tendency to relapse—a constant source of re-admissions and inefficiency, and demanding incessant supervision and treatment. Occasionally, the palpebral tissues were so matted together as to produce permanent thickening, with partial immobility of the lids, especially the upper, and in one completely opposed the action of the levator palpebræ muscle. Laxity of the eyelids generally, and want of tone in the sphincter muscle often remained for some time subsequent to discharge from hospital, and in one occlusion of one canaliculus followed. Occasionally, after termination of all treatment, a man would return with a limited swelling of one of the lower lids; on separating it from the eyeball, a small abscess, the size of a No. 1 shot, would be detected in the submucous tissues, evidently suppuration of one or more of the follicles.

Exciting Causes of the Engrafted Ophthalmia.—The predominance of the dual over the single eye implication has been previously shown, and especially characteristic of the early cases, while in rather less than a third a complete limitation to one eye was present, with greater frequency in the severe and later cases; the explanation probably being that in the former the exciting cause was the growing follicular mass, and consequently bi-lateral; in the latter, external agencies, and often unilateral in operation and results. In a few cases the diseased action on the one side would produce sympathetic hyperplasia in the follicles of the other, the induced lesion, however, never arriving at the same intensity; while also a retrogression of the grey granulations in the non-involved lid was occasionally seen during a prolonged residence in hospital from single ophthalmia. Of the predisposing tendency to severe inflammation, from slight causes, of the follicles there could be no doubt, nor their capability of originating and advancing to granular lids under favouring circumstances, irrespective of active inflammatory action. The presence of the grey granulations substantiated, the nature of the agent determining the conjunctivitis seems of but secondary importance, any mucous membrane irritant sufficing; the engrafted lesion being invariably out of all proportion to what the ascribed cause would have produced in a prior healthy lid. The impossibility of establishing from interrogation of the sufferers, or by strictest scrutiny, a basis of causation for prophylaxis and eradication was very apparent. In reference to the experience in the 22nd Regiment, the only factor which was unquestionable was the exposure to night air and variations of guard-room temperature with general atmosphere,† not only productive of a few primary attacks, but very constant in determining relapses. In the majority, 68 per cent., there was no ascribed cause, but the remainder embracing smoke, dust, glare and heat, draughts of cold air, sleeping in open air while on guard, flash from nipple of rifle, irritation from snow, running of perspiration into eye—so uncertain and variable, however, as to be worthless for theoretical deductions or practical application. In three cases there was reason to believe that transferrence of purulent matter was the agent, and in one maliciously generated.

Corroborative also are the data furnished in the Army Medical Returns for

* It would appear to be a matter for elucidation whether the altered nutrition of the eyeball, consequent on long-continued hyperœmia and hyperplasia in the adjacent tissues in early life is not frequently productive of visual derangements. I have often been struck in recruits with the frequent association of defects in accommodating power of eye with evidence of early ophthalmia as to suggest a relation of cause and effect.

† "Exposure on guard is another of the causes assigned by Dr. Jennings. I have "met with several instances, some among the invalids of the present season, who "distinctly refer their first sensations of uneasiness to a night guard."—Remarks by Mr. R. Lawson, "Army Medical Report," Vol. v. p. 342.

the Service generally, opinions fluctuating vastly, the attempt to elucidate sufficient causation resulting in an avowed impossibility, or a refuge in "existent for a long time," climatic causes, or contagion.* Unquestionably the latter is the only one of the ascribed factors of sufficient potency to explain the endemicity of the disease; for while dust, glare, heat, draughts, solar radiation, and foreign bodies may separately or associatedly produce an occasional conjunctivitis, yet the connection between them and ophthalmic prevalence is based upon a very frail foundation. It must be remembered that the disease is not common to masses of men constantly exposed to the influence of one or other agency. The Arabs of the desert,† with their dust, glare, and heat; the Canadian exposed to snow irritation, solar radiation, and rigors of climate for six months of the year; the seafaring man; the Indian trapper, and those constantly pursuing their avocation in the open air; the upper stratum of the community,—all enjoy an immunity, while limited segments of the poorer classes living an indoor existence, under every variety of climate, furnish its victims in civil life, and isolated corps, all but limited to the ranks of the Line, exemplify the disease in the Army. Excluding these epidemic agencies as insufficient, the explanation of its endemic prevalence is demanded. The highest authority on Army sanitation ‡ inclines to contagion as the method of its propagation, which is often adduced as the explanation of its diffusion throughout a regiment; a primary case granted, the transferrence of the malady from one to the other being sufficient, in the opinion of some, to account for the phenomena to be gleaned from an infected body of men,§ extending over years, and in spite of all the means at disposal which discipline and unlimited authority render available for the eradication of any diffusible virus. It is of paramount importance to arrive at a correct conclusion on the subject, for it is from accurate data on its origin and distribution that measures for its eradication must be educed. The Medical Reports demonstrate the existence of endemic ophthalmia in the Army during a long series of years, and its presence at this time, notwithstanding constant repressive proceedings. The question then may be fairly asked,—Do the facts observed in an ophthalmic corps substantiate the hypothesis of contagion as the main element in diffusion, or as influencing it in but the slightest degree, and are the results obtainable from practice based on such a theory of so cogent a nature as to anticipate a probable early lessening of the disease and its eradication in the future? Experience decidedly negatives this, and bids us direct our attention elsewhere for the solution of the problem. It is impossible to deny the capability of producing an ophthalmia by transferring the secretion to a healthy individual, or that in a few instances of neglect its diffusion may not be traced in an infected regiment to such a cause; but it may be unhesitatingly asserted that in a given body of men with grey granulations in the lids, in spite of the most rigid isolation and complete seclusion of the ophthalmic from the healthy (and this I believe is the constant practice in the Army generally, and enforced by the Regulations), cases of severe disease will occur from agencies of the

* Extremely important are the deductions of Mr. R. Lawson (vol. v. p. 339, "Army Medical Report") from the ophthalmia at the Cape. He shows the necessity of "something to account for its irregular outbreaks and irregular appearance "among different descriptions of force, beyond the usual assumed causation," "its "development among certain persons often occupying a limited space, while others "in their vicinity are nearly or altogether exempt," as well "as its presence in a given "regiment or a barrack not being followed by like conditions in the succeeding body "of men"; "something to account for its variations, the external conditions remaining "the same, with little or no change for many years in succession."

† "Glare and dust alone seldom cause eye disease. Everybody knows that "ophthalmia is unknown in the desert; and the people of El Hejaz, who live in an "atmosphere of blaze and sand, seldom lose their sight."—Burton, "El Medina," vol. iii. p. 176.

‡ Parkes, "Practical Hygiene," p. 495-581.

§ Independent testimony scattered throughout the Army Medical Reports substantiate the earliest cases in a corps commencing ophthalmic as "invariably slight, "easily cured, and widely diffused." Is not this opposed to pus inoculation, and all the evidence derived from indubitable instances of direct transferrence in a community?

most innocuous nature to lids uncontaminated by these follicular growths; and that provided only ordinary care be used to counteract diffusion, not one in fifty cases originating in an ophthalmic regiment can be fairly placed to contagion, while when extraordinary preventatives, such as frequent inspections, quarantine, &c., are observed, the transferrence of the disease, either direct or through the medium of the atmosphere, is out of question. It is not at all exceptional to find one company with men of relaxed lids, the sequelæ of acute disease, producing no fresh cases when a possible communication might be urged, nor, on the other hand, for a company hitherto free to furnish severe cases in succession when not the slightest foundation for intercourse with affected could be inferred, but traceable to external irritants on the susceptible lids. The frequency with which affected and healthy mingle together, with but slight limitation to free intercourse,* unattended by transferrence of the virus, certainly would suggest the inference that too great a value has been placed upon contagion as the usual method of dissemination, to the exclusion of other agencies, all potent for its origin and persistence. That all purulent discharges from the conjunctiva can originate an ophthalmia is unquestionable—that under bad hygienic conditions and overcrowding,† epidemics are traceable to such a cause, and subdued by practice based on such evidence, is also so—yet to infer that all ophthalmiæ are akin in nature and origin, and when endemic to owe this feature to contagion as a basis of extirpation, is certainly antagonistic to the data derivable from the British Army, and leaves the fountain-head of the malady intact to pursue its ravages year after year, with such modifications only as are fairly deducible from the extending sanitary reforms.

Endemicity of Ophthalmia.—That the endemicity of ophthalmia is due to the grey granulations predisposing to conjunctivitis would appear decided; a recognition of their *de novo* origin in a foul, long-continued, vitiated atmosphere, and the relation of the induced inflammation as engrafted—modifying but not producing these bodies, and dependent on them for chronicity—have been enforced. From this it follows that a basis for stamping out endemic granular ophthalmia, ignoring the germs, would be on a par with an attempt to banish the ophidians, unmindful of the ova deposited in the sand for maturation by the sun. So long as grave defects of hygiene characterize the barracks of certain foreign stations will ophthalmia maintain a high position in causing temporary inefficiency and permanent loss in the Service. It is only by an acknowledgment of the dependence of the inflammatory attack and its chronicity upon the primary element quiescent for a lengthened period until external agencies indicate its potentiality, that an explanation is furnished of the frequent irregularity of ophthalmic outbreaks in certain barracks in the successive bodies of men occupying them—a healthy site with free ventilation, full exposure, immunity from prior disease, suddenly showing

* Perhaps the most complete intercourse is that between mother and child, yet how seldom do we see the disease communicated in *Ophthalmia neonatorum!* The undoubted instances of transferrence of purulent matter pertains to children in schools or workhouses, seldom to adults when unintentional.

† As showing the influence which an atmosphere vitiated with the excretions from the skin, lungs, and body of human beings may exert on the conjunctiva, are the outbreaks in the slave vessels recorded by Mackenzie:—"In 1819, the 'Roheur,' "a slaver, French crew all healthy; the inhabitants from amongst whom the slaves "were taken had no trace of ophthalmia, neither had the slaves themselves until "fifteen days at sea; the originating conditions being extreme crowding, partial "absence of light, diminished supply of water, hot equatorial temperature; disease "very virulent, quickly implicating the eyeball and destroying the sight; it con-"tinued to rage until arrival at Guadaloupe, when removal from the stagnant "vitiated air to pure atmosphere and cold-water applications soon subdued the "disease. The same vessel met a Spanish one in similar circumstances." Mayhew, in the "Horse Doctor," notes the intimate connection between specific ophthalmia, foul stables, and bad air, as well as its chronic nature and tendency to relapse, and slightness of the imputed cause to the grave local lesion. He says, "In the South "of Ireland, where poverty prevails, humanity is obliged to shelter itself in strange "places, and any hole is there esteemed good lodging for a horse. In that part of "the kingdom, ophthalmia affects the majority of animals; it not only preys on "horses, but seizes on mankind."

a high rate of admissions consequent on a change of corps;* equally seen also on transferrence of regiments from certain foreign stations to a healthy climate, but of rigorous atmospheric agencies, the clue unquestionably residing in the prior existence of the grey granulations.

Question of Specificity.—The impropriety of affixing the limiting term "military" to the disease, as though peculiar to this segment of the community, was pointed out in 1860 by Dr. Frank, yet it is much to be regretted that some qualification expressive of the morbid prodroma, as an adjunct to the term denoting the tissue implicated, is not in general use. The grounds for raising it into a specific form are not so clear, trending as they do upon the possibility of its producing the like through the medium of the secretions. The following facts strongly oppose any such deduction:—

Isolated outbreaks of ophthalmia occurred in the married families of the 1st Battalion 22nd Regiment, during the latter part of the summer of 1865, at Malta, as follows:—The quarters occupied were those of Burmola Curtain and Polverista in the Cottonera district. At Burmola Curtain the disease originated in a very dirty family, of which all the members, except a young child at the breast—father (sufferer in the year following from granular ophthalmia), mother, and two girls—had vesicles in their lids. On the 15th August, after a few days strong wind and dust, inflammatory action of apparently catarrhal nature was superadded to the unhealthy lids of the elder girl, followed by the same condition in the younger on the 18th. On the 24th a boy in another family, a schoolmate of the elder girl, had severe purulent ophthalmia, and transferred it to his sister on September 4. Between August 28 and September 4, all the children (seven) of the three other families, living in the same passage with the first family affected, suffered from the purulent form, which was easily prevented extending by the quarantine of the affected. Careful examinations, before and after, of these sixteen families in this block of quarters failed to detect the presence of the grey granulations in any except the Power family, the originators of the disease. In these, the nature of the superadded inflammation was rather catarrhal, and limited mainly to the lids, while that propagated to the nine other children was of the severe purulent variety, with great chemosis of the sclerotic conjunctiva; yet the subsequent progress of the cases demonstrated the influence of the follicles in prolonging the engrafted conjunctivitis, for, while the two Power girls presented anything but a healthy state of the lids three months after the attack, all the propagated purulent cases had terminated in convalescence within four weeks. In no instance did grey granulations ensue as a sequel to the ophthalmia, and the same was noted in the baby Power, who subsequently suffered from the disease, probably contracted from the sisters.

At the Polverista quarters, about one-third of a mile from the former, the disease dated from August 14, in a girl (Griffiths) 8 years of age, with vesicles in the lids, the exciting cause "dust and wind." Purulent ophthalmia was transferred first to the two sisters and children in the same block, and next, by means of a playmate, to a dirty family in an adjacent locality, where the four children and mother suffered. Twenty-two children in all were affected, and, as at Burmola Curtain, rigorous isolation at once put a stop to the propagation of the malady, which followed the same course in the one quarter as the other, with this exception, that one girl who had a previous remarkably roughened membrane (hypertrophied papillæ both in upper and lower lids) from frequent neglected attacks of conjunctivitis, suffered from prolonged chronic disease equally with those primarily vesicular. The propagated purulent ophthalmia in a prior healthy lid—although from the attendant chemosis, intense vascularity, and profuse discharge, apparently a more dangerous malady than the catarrhal affection engrafted on grey granulations—succumbed readily to treatment, and in every case terminated in a normal state of the membrane. In this respect the contrast was most marked, and beyond all doubt.

Another instance may be quoted in which two or three cases of chronic

* Exemplified as early as "1805 at Hythe on the arrival of the 52nd Regiment, "636 out of 700 (mostly Irish recruits) were ophthalmic. 43rd Regiment and "Lincolnshire Militia free; as well as the residence of the French soldiers in 1832, "in the Belgian barracks, without infection."—Quoted in the "Medico-Chirurgical Review" for April, 1868, p. 398.

granular lids, with purulent discharge, were placed with healthy men under bad conditions, highly conducive to propagation. Here two severe cases and twelve slight ones followed, while men immediately adjacent, and under the same general conditions, were entirely free. Rigorous isolation at once stopped the spread, and in no case did vesicles result when a prior healthy state of the lids was in existence.

From these facts we may deduce the following:—(*a*) The necessity of segregation of chronic ophthalmia with purulent secretion, unless good sanitation be present; (*b*) the independent origin of granular ophthalmia under ordinary agencies, when grey granulations are primary elements; (*c*) the nature of the communicated lesion—purulent; (*d*) the facility of eradication and the absence of chronicity in prior healthy lids; (*e*) the absence of grey granulations consequent on the transferrence of the secretion from a granular lid to a healthy eye.

If then specificity in disease is to receive the same rigorous translation as in the animal world, and to include those sections only capable of, and invariably producing like, the justice of raising this ophthalmia to such a basis receives a rude shock,* which does not lessen if we exclude the superadded inflammation as non-essential, and limit our attention solely to the primary and essential elements, the grey granulations; yet, excluding the capability of propagating the like, inasmuch as the enlarged follicles are the fundamental principles, both in a clinical and etiological point of view, the propriety of differentiating this into a distinct variety of conjunctivitis cannot be questioned.

Source of Inefficiency in Campaigns.—In order to estimate at its proper value the latent elements of inefficiency and sickness always present in a regiment or corps endemically affected with follicular conjunctival disease, and ready to assume grave proportions as soon as ultra exposure, such as invariably happens in camps and on active service, shall give the necessary impetus, we have the teachings of the excessive admissions from ophthalmia in the garrison of Malta in 1857-59, consequent on the arrival of nine regiments from the Crimea, from 76·28 per 1,000 of strength in 1856 to 205·27, 155·5, 108·96 per 1,000 from 1857 to 1859 respectively,† indicating it clearly as one great source of inefficiency during the war; the Chinese war in 1860, when "ophthalmia was twice "as prevalent during the campaign as in the preceding period, chiefly in the "1st Battalion 3rd and 67th Regiments, imported with them from India, and "following them throughout the whole campaign, while the Native troops "were exempt from it";‡ the outbreak in "the detachment of the 1st Bat-"talion 3rd Regiment, wrecked at the Cape on its voyage home from China";§ and the prevalence of the malady in 1862-63 in New Zealand, in the 70th and 40th Regiments, especially under the exceptional circumstances of camp and hut life, constituting during the period "the most prominent cause also of "invaliding."‖

Treatment.—From what has been previously stated, it follows that the prophylactical and therapeutical agencies applicable to the primary follicular lesion and subsequent ophthalmia merge the one into the other—sanitation predominating in the former phase, medicinal applications in the latter. The essentials of this ophthalmia (grey granulations) being granted, with their endemic dependence on vitiated atmosphere, but little doubt is left as to the necessary measures to oppose its *de novo* origin in the Army—a rigid exclusion

* Wells on "Diseases of the Eye," p. 51, states,—"It," *i.e.* the discharge from acute granular ophthalmia, "does not necessarily produce the same affection, but "may give rise to catarrhal, purulent, or diphtheritic conjunctivitis"; and at p. 28, after repeating the same of purulent ophthalmia, continues,—"The special form of "conjunctivitis which may arise will depend on atmospheric, local, and constitu-"tional causes, and also upon the age of the patient." A question arises from this: Is there any specificity in conjunctival inflammations especially in regard to propagation, and are they all varieties merely of one form of lesion; and if so, dependent for variation on such elements as above mentioned, what is the worth of the clinical differentiations set forth in textbooks on the subject, to say nothing of the etiological basis attempted?

† Marston, in "Beale's Archives of Medicine," 1862, p. 15.

‡ "Army Medical Bluebook," 1860, p. 107.

§ Ibid. p. 135. ‖ Ibid. 1863, p. 109.

of recruits, with the germs already advanced, from the civil hotbeds of the malady; a healthy dry atmosphere, day and night, in every barrack occupied by the soldier. The evidence on this head substantiates that afforded by the presence of phthisis, continued fever in the Army, added to struma and anæmia in civil life, and demonstrates that the safeguards against climate and atmospheric vicissitudes, human habitations, contain within themselves the components necessary for the origin and development of the disease; the light and fresh air, against which such barriers are erected, being found the most efficient factors in its eradication. The frequency of origin of the granular ophthalmia in certain foreign stations—*e.g.*, Malta, the Cape, and especially in certain barracks, notoriously in the former Ricasoli, San Francesco di Paolo, and lower St. Elmo—and the necessity of residence during at least twelve months for the complete endemicity of the grey granulations have been before observed; careful enquiry would no less clearly indicate the barracks serving as foci at the Cape and the plains of India, and would suggest the desertion of these hotbeds,* or at least their occupation by one regiment or corps short of a year, followed by a succession of healthy quarters. However, the existence of the follicular lesions being certified, the course for their suppression would appear no less clear—removal of the men from the fostering dwelling air,† and transferrence to an equable atmosphere with good hygienic constituents, devoid, as far as possible, of external exciting agencies capable of engrafting inflammation upon the already predisposed lids.

Characterising the presence of the grey granulations are numerous cases of "weak eyes," the lids glued together at night from slight discharge, the early stage of the adult granular ophthalmia. The advantage of frequent inspections, twice a week, for the isolation of the advanced cases, and attempted arrest of development of the vesicles by therapeutic measures, is fully attested by results. In the 1st Battalion 22nd Regiment it was the custom to segregate these men and to enforce daily attendance at hospital, with attention to the general surroundings in barrack. The application of a solution of nitrate of silver (10 gr. to 1 oz.), by means of a small narrow brush, carefully employed, with surplus of fluid removed, to the lower lid, with simple ointment or tannic acid in glycerine (1 dr. to 1 oz.) at night, was very efficacious in restraining the growth of the granulations, and by diminishing the general irritability of the conjunctiva, rendering engrafted inflammation less probable. There was no relief from duty for these men, and the results were often very satisfactory, a curtailment of the associated vascularity being invariable, and occasionally followed by a cloudiness and rupture of the granulations, the honey-combed conjunctiva gradually regaining its normal condition.

The occurrence of severe cases of ophthalmia among follicular lids, from external agencies, being certain, despite rigid inspections and isolation of the more advanced granulations, it becomes an important point to withdraw the individual from the mass, for prevention of possible communication of purulent ophthalmia, before and subsequent to discharge from hospital, and to bring the case as early as possible under treatment. The therapeutics of the milder forms resolve into fresh air, cleanliness, rest of organs, astringents, and counter-

* As has been constantly observed by competent authorities, putting on one side all ideas of humanity and duty of State to its *employés*, there can be no conceivable doubt that the cost of erection of new barracks on proper sanitary principles, on well-chosen sites, would in a short time amply compensate, by the saving of life and service, through curtailment of preventible sickness and death.

† Irrespective of the experience of Stromeyer as regards good ventilation in the Hanoverian Army, and the evidence furnished by the Danish and Portuguese as to desertion of barracks, numerous instances could be adduced to show the beneficial results of removal to a good sanitary quarter, the climate remaining the same: *e.g.*, 2nd Batt. 3rd, 2nd Batt. 15th, 2nd Batt. 23rd, and 2nd Batt. 22nd Regiments exemplify this by transferrence from the town barracks in Malta to the country one at Pembroke Camp. In the 2nd Batt. 23rd Regiment, a removal to a crowded, badly ventilated barrack again witnessed the return of the disease with redoubled force, to be again subdued by a transferrence to Pembroke Camp. Of the results of removal to a different climate, the Army Returns are full: the 22nd Regiment well demonstrated it, Malta originating the disease, a departure of one Battalion to New Brunswick and the other to Mauritius witnessing its decline.

irritants for the subduing of the inflammatory process; the severe, with complications, are extremely varied. Left to pursue a course unmodified by medicinal applications—the adoption of *laisser aller* system, with its universal curator, time—the severe forms unquestionably advance from bad to worse, to complications and impairment or loss of sight. The duration in hospital being invariably long, the necessary restraints upon personal liberty, and the mental weariness consequent upon exclusion of books from the presence of diseased action in the adjacent tissues of an organ of so vital an importance as the eye, the wear of the moral faculties from brooding over sensations and feelings ever reflected and intensified, render the general treatment no less important than that demanded by the local lesion. Photophobia is all but absent until complications ensue, hence there is no demand for the shutting out of light, which undoubtedly tends to produce, in no small degree, the etiolated figures so frequently met with in an ophthalmic corps. To ensure abundance of equable healthy air, to leave the lids free from all excluders of atmospheric contact, curtailing the direct rays by a properly adjusted shade, to surround the patient with hygienic conditions, and absence of all exciting agencies, to enforce rest of organ, rigid cleanliness, and prevent the transmission of the virus either to an eye not primarily involved or to another individual, with attention to general health, and maintaining *cheerfulness** and *hope*, are essential as generalities.

The tendency of the engrafted inflammation *is to develop quickly to an* acme, and, receding more slowly, to pass into a chronic state of vascularity, limited generally to the lids and palpebral sinus, with a few isolated, enlarged, sclerotic vessels, under which the granulations (grey and papillary) are rapidly advanced. To curtail this inflammation, as far as possible, is the first element in the curative process by the usual remedies; subsequently to attack the chronic passive hyperæmia and its attendant lesions, by far the more difficult, inasmuch as the vascularity and hypertrophy of the upper lid papillæ (whose prior or early presence demands recognition) react the one upon the other, and receive mutual support from the follicular elements studding the lower lid, the least influenced by medicinal applications. Leeching and sedative fomentations (hot or cold, according to the degree of relaxation present and feelings of the patient), with counter-irritants frequently repeated, as well as a leech occasionally applied to the conjunctiva at the outer canthus for the chronic condition, are adjuvants; but unquestionably the local applicants to the inner surface of the lids are the most potent. To prevent the development of the papillæ in the upper lid, or to reduce them if present, and so to diminish the probability of corneal involvement, is of vital importance. Discarding strong escharotics, difficult to limit in action, such as nitric acid or potassa fusa, the most useful among the medical armamenta is nitrate of silver of different strengths proportionate to the required results. From 10 to 15 grs. to 1 oz. of water, the astringent action predominates, possibly also with destruction of germs in the secretion; from 20 to 30 of strength, the escharotic, intensified in the solid form;† by a small, delicate brush or pointed end, carefully applied,

* The system of segregating ophthalmic patients has many points which may be reasonably criticised. Provided hospitals be fit receptacles of sick—*i.e.*, ample in cubic space, free general sanitation, good means of ablution, with separate towels and careful supervision—the improbability of communicating the disease to others by general commingling may be fairly assumed, unless maliciously sought for, while the advantage to the ophthalmics by diffusion (not resident constantly in the concentrated atmosphere of one apartment), and the general increase of cheerfulness from conversation with, and enjoyment of the readings of, their fellow patients is evident, especially when the depression and weariness of the occupants of the ophthalmic ward, wandering in search of a method for passing time, with intensified feelings reflected from one to the other, is taken into consideration. The necessity of a separate room for exclusion of light, when complications ensue, is seldom in its occurrence.

† The effects of solid nitrate of silver and potassa fusa upon the mucous membrane of the cheek are carefully delineated in Sir H. Thompson's "Stricture of the Urethra," p. 196, and apply with equal force to the palpebral membrane:—"The "application of argent. nit. for 20 or 30 seconds is followed in 10 minutes by the "detachment of a layer of epithelium, usually none or a very slight smarting, suc- "ceeded by a slight increase of vascularity, and terminating in 72 hours in a healed

with warm water or solution of common salt at hand to wash away or neutralize any surplus, delicacy of localization can be produced. As regards the period of utility of the caustic, it would appear to be limited to that stage when the intensity of the conjunctivitis has been reduced by treatment, or subsided into the chronic hyperæmia (in the early stage it rather adds to than curtails the vascularity), and as long as the granulations exist. Locally applied to these latter early, it unquestionably prevents their advance and limits their development; while used in the solid form, or escharotic solutions, to the mature hypertrophied papillæ, the potency of disintegration of the caustic is no less evident. The theory of its action in the solid form, and the purpose intended by the cauterization, is, according to Stromeyer quoted by Wells, "not that of "chemically destroying the granulations, for this would lead to great and "lasting injury of the conjunctiva, from the destruction of its secreting organs "and the formation of dense cicatrices, but to maintain a certain degree of "hyperæmia and inflammation of the conjunctiva in order to hasten the "absorption of the granulations."* It has been previously stated that at the examination, in April 1869, of the 22nd Regiment, all the lids completely recovered from severe ophthalmia demonstrated the existence of cicatrices, not deep but superficial in their nature, resembling those depicted by Sir H. Thompson; and the quickest recoveries were those where, from the early application of solid nitrate of silver along the upper tarsal edge, a small slough separated, leaving the white cartilage visible, subsequently obscured by the temporary increased vascularity. The rough tuberculated papillæ of the upper lid being the cause of the corneal involvement, their removal suggests itself, advantageously effected, if very large or pedunculated, by scissors, or, if close set and small, by caustic, the adoption of such treament being followed by great relief to the patient. The possibility, however, of removal of these granulations (the hypertrophied surface elements) is limited to the early period of the inflammation, inasmuch, as it has been previously pointed out, that from friction and melting down of superficial structures from long-continued action, these rough papillæ disappear from the upper lid, leaving a surface intimately blended with the deeper tissues, and resembling the granulations of an open sore. In this stage it would be equally impossible to remove these as to attempt the extirpation of the follicles of the lower lid by caustic or otherwise, destruction of tissues necessarily following such attempt in both. It would appear that it is to the later stages that the remarks of Stromeyer, of very valuable import, apply; certainly they are not borne out by experience in the earlier stage. No cauterising agency seems of so much efficacy, or accompanied by so little inconvenience, as the nitrate of sitver; and its best results are seen in those cases where the hyperæmia is in the minority, and the granulations of the upper lid hard, firm, thickly studded, and of a bluish hue; their destruction is easily accomplished, with less tendency to return. The necessity of carefully and cautiously applying either the nitrate of silver or any other application cannot be too strongly enforced, as well as the avoidance of all "dropping into the eye" of solutions. Compressers saturated in cold astringent sedative lotions, and applied to the lids for a lengthened period, especially so long as heat or great vascularity exist, are productive of much good. The rubbing in of powdered acetate of lead between the granulations, as practised by Buys, is prominently brought forward by Wells,† the result being a dwindling away and disappearance, with a rendering of the secretions non-contagious. Whether the medicinal agent or the mechanical friction is the

"whitish surface, depressed, with faint radiating lines converging to the centre, "with a degree of contraction around." A piece of potassa fusa (1-12th of a grain) applied for 30 seconds produces a slough the size of a split pea in 3 or 4 minutes, which subsequently increases in size and depth to 1-10th of an inch, with tenderness, swelling, and increased vascularity, terminating "on the 14th day in a depressed "cicatrix with thickening around." He remarks on the latter, "I confess I was "not prepared to witness results so active and enduring from the use of a portion of "potash weighing less than the 36th part of a grain."

The mixture of nitrate of silver with one-half or two-thirds nitrate of potash is suggested by Wells, p. 33.

* "Diseases of the Eye," p. 57.

† Ibid. p. 58.

more potent in this practice is not stated; if the latter, then it is a scientific exemplification of the process in vogue among the lowest class in the Mediterranean; if the former, the question suggests itself, whether a strong saturated solution might not be of equal efficacy, and with less annoyance to the patient than the irritation of rough particles. If its anticontagious quality be substantiated, "so that soldiers with granular lids need no longer be separated "and confined from the others, but may, if they are able, resume their duties "without danger of spreading the disease,"* all prevention by transfer lies in a nutshell.

The riddance of the rough granulations is not, however, the difficulty; a smooth upper lid, extra vascular, having been brought about, the prevention of the relapse and re-sprouting forth of the papillæ is the problem—the curtailment of development to such extreme degrees as characterise the cases in civil hospitals. The destruction of the hypertrophied follicles of the lower lid is therapeutically impossible; their recession after severe inflammation cannot be ensured without long-continued careful treatment, good sanitation, and freedom from all exciting agencies, yet it is their presence which sustains the palpebral hyperæmia, stimulating the growth of conjunctival elements. The astringent solution of nitrate of silver, or strong proportion of tannic acid or alum in glycerine, require to be carried long into convalescence and for the prevention of relapses, often following a slight indiscretion on the part of the sufferer whose patience is tested to the limit of human endurance, a prevalence of warmth and moisture in the atmosphere, and frequently from no ascertainable cause. Should complication ensue, the cause is to be found in the upper lid; a persistence in the treatment of suppression with atropine and opium for the relief of pain, counter-irritation, &c., according to the predominating features, give the best results. The application of caustic might at first sight be supposed to be contra-indicated with corneal involvement, yet carefully applied the relief is very great, and strikes at the fountain-head of causation. In reference to the various sequelæ, with their appropriate treatment, the elaborate work of Mr. Spencer Wells on "Diseases of the Eye" fully details; such cases ought to be of very rare occurrence in the Army.

Exercise in the open air, away from the glare of the sun and wind and dust, freedom from all avoidable irritants,† attention to the general health, light nutritious food, and surrounding the patient with careful sanitation, are very necessary. The wear and tear of body is apparent, but the stress upon the mind, and especially the moral faculties, in this disease, few but the sufferers can appreciate, and demand every possible consideration and thoughtful sympathy from the Surgeon and attendants. With the discharge from hospital the treatment does not terminate; the tendency to relapse, from the laxity of the tissues and the follicular elements, on the slightest exposure, and notably in the Army night duty, persists for months and even years, to be opposed by care, sanitation, and nightly application of the tannic acid and glycerine. Separation from the healthy,‡ removal from the foci of production, rebuilding up of stamina of system, are self-evident.

Unquestionably the advantage of early treatment in the prevention of profound organic lesions in the lids and tissues of the eye is very marked; and provided such could be effected, together with good subsequent sanitation, defects of sight and especially disorganization of the eyeball as sequelæ would be seldom seen. It is only by constant supervision that men in the Army can be

* "Diseases of the Eye," p. 59.

† The smoke of tobacco is a common cause of relapse in the Army. The patient no sooner gets away from the supervision of the attendants than he makes up for his long deprivation of the pipe; he seeks a retired corner, and with head bent down on hands, and elbows on knees, he undoes the work of weeks, and pays only too dearly for his temporary gratification.

‡ The experiments of Firinger, quoted by Wells ("Diseases of the Eye," p. 28), show "that the discharge of purulent ophthalmia during the early stage, and also "in chronic cases when watery and transparent, is hardly at all contagious." The commingling of relaxed lids, with little secretion, with healthy men, fully attests this; but inasmuch as it is impossible to prevent a semi-purulent product in weak lids from slight exposure, when no doubt exists of its capability of generating an ophthalmia, the precaution of long-continued segregation commends itself.

early brought to hospital, inasmuch as the subjective symptoms are but of the slightest inconvenience, how much more must this deterrent be in operation in civil life, when treatment in hospital means frequently want and privation to the younger members of the family at home!

The eradication of the disease from the community at large must be relegated to that period when the science of hygiene shall rise paramount to pecuniary obstacles, when the soldier on foreign service shall receive that consideration and care due to one who resigns his self-will for the benefit of the State, when advancing civilization shall render apparent to the poorest of the social scale the necessity of sanitation for the preservation of "a sound mind in a sound body," and shall force upon the employers a recognition of their responsibility for the well-being of their *employés*.

APPENDIX No. XVI.

ESSAY

"On the Etiology and Prevalence of Diseases of the Heart among Soldiers, as compared with the Civil Population of those Countries in which they are called upon to serve, and the Means of Prevention or Mitigation,—due regard being had to those Conditions in which the Soldier is unavoidably placed."

By L. CORBAN, M.D., Assistant Surgeon, 21st Hussars.

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"The physician understands no disease if he does not understand its actual and "certain cause; he cannot remove it if he cannot remove the cause; the knowledge of "their causes is the philosophic knowledge of diseases, and the physician is a philosopher "who has this knowledge."

AFTER considerable reflection and careful search, I have chosen this motto as being most applicable to the theme of the following Essay. It is quoted by Rich from Zimmermann, and commented on by Dr. Parkes in his Annual Report on Hygiene for the year 1867. The subject of the first competitive essay for the Alexander medal—the Etiology and Prevalence of Heart Diseases among our Soldiers—is one of considerable importance, worthy of careful study and close investigation, interesting as regards the health and efficiency of the soldier, and a question, the clear elucidation of which will confer great benefits, in a financial point of view, on the country, and physically on the troops,—being truly a matter of common humanity. In undertaking this subject it is necessary to appreciate its magnitude, and the many difficulties which are to be met before a satisfactory statement, or one likely to have good results, can be given. In the case of soldiers, the yearly statistics show at a glance our annual loss by deaths and invaliding from diseases of the heart. On the other hand, with regard to the same class of diseases among the civil population in the United Kingdom, our knowledge is more scanty; and in most of our colonies no returns of heart diseases among the native population are drawn up. In some of our possessions, India for instance, in some of the large cities, weekly returns of mortality are published; but no information of any importance can be gleaned from these returns, as far as the subject of heart diseases is concerned, diseases of the heart, arteries and veins, being included under the general term, "Diseases of the Circulatory system."

There is another great difficulty in forming anything like a correct estimate of the prevalence of heart diseases among the civil population in the United Kingdom, owing to deaths occurring in many remote districts in town and country. Many of these cases, in all probability, have never been seen during life by a medical man, and even if seen he has not the same facilities for confirming his diagnosis as the Army Medical Officer; for in civil life *post-mortem* examinations are difficult, and often impossible, from the objections of friends. On the other hand, a *post-mortem* examination is made on every soldier who dies in time of peace. It may be well to remark here that civil statistics may be vitiated to a slight extent by pensioners thrown on the civil population with heart diseases caused by military service.

In most of our colonies, the causes of death among the natives are obscure in the extreme, and naturally deaths from heart diseases are no exception to the above fact. In India, the natives die in numbers, unseen and unheard of; nor can any information of value, as regards heart diseases, be obtained from the sick returns of the Native troops, for caste prejudices oppose an insurmountable barrier to pathological research.

It is unnecessary to dwell any longer on these sources of error and doubt; from the above it will be seen that they are numerous and perplexing.

I have remarked in the opening part of my Essay that the subject is of financial importance. In proof of this, it may be sufficient to point out the great outlay incurred by the State in the enlistment, preparation, and equipment of the soldier. This charge, in the event of subsequent death or discharge for disease, is a dead loss to the public; and as each soldier is estimated as having cost the State about 100*l.*, more especially those on the Indian establishment, the desirability of losing as few as possible by early death or discharge is manifest.

The following pages it is hoped will show how it affects the physical condition of the soldier; and as a consideration of humanity it will perhaps in this place be sufficient to indicate the evil of implanting an incurable disease on the recruit, necessitating his discharge from the Service with probably a pittance or no pension, and being incapable of earning a livelihood, his life a misery to himself, a burden to his friends or his parish, and perhaps his condition is a warning to deter others from entering a service which has been so disastrous in his case.

Before enumerating the great causes of heart diseases in our Army, it may be advisable to glance at our total yearly losses from heart diseases, taking the mean of five years, 1862-66.

TABLE of Admissions, Deaths, and Invaliding from certain Heart Diseases in the entire British Army at Home and Abroad: mean of five years, 1862-66. Mean Strength for five years, 1862-66, 184,300.

Diseases.	Admitted.	Died.	Invalided.	Remarks.
Pericarditis	88·8	7·8	14·6	This Table has been compiled from the Blue-books. Morbus cordis, degeneratio cordis, and angina pectoris have not been included, as they occur rarely in the returns. I have included aneurism of the aorta for reasons to be found in the following pages.
Hypertrophia cordis ..	260·	15·	125·8	
Morbus valv: cordis ..	624·	64·2	267·9	
Palpitatio	148·	..	25·7	
Aneurisma aortæ ..	47·	43·2	13·5	
Mean yearly total ..	1167·8	130·2	447·5	
Total loss	..	577·7		

This short Table shows that about 6·33 men in every 1,000 were admitted yearly, that the deaths amounted to about ·70 per 1,000, and our losses by invaliding were about 2·42 per 1,000 from the above heart diseases, taking the mean of five years, 1862-66.

The abstracts in the Blue-books show that the Army loses every year, by deaths and invaliding, taking the mean of five years, about 578 men from heart diseases alone—a loss equal in fact to more than half a regiment.

This alarming fact ought to make us pause, and try to realize the magnitude of the evil, the suffering induced, and the loss incurred by the State, in order that a remedy may be discovered.

If the subject was worthy of investigation from no other aspect than a pecuniary one, that alone would invest it with importance, as an annual sum of about 57,800*l.*, at the lowest computation, is the bill the State has to pay for deaths and invaliding from heart diseases among its troops. A considerable portion of this sum is paid by the Indian Government; nevertheless the loss takes place, and the above sum is perhaps under the mark, as it does not take pensions into account.

It has been said that the logic of facts is "inexorable," and facts combined with figures are of still greater value. What question then of greater urgency, with regard to the welfare of the soldier, can be investigated? More especially, as will be pointed out hereafter, since the remedial measures recommended in the case of heart diseases have a more extended bearing in benefiting the Army in other ways, contributing to comfort, diminishing sickness and mortality from other diseases, and promoting efficiency.

Fortunately this subject has been ably taken up by several Officers, and by their exertions benefits have been conferred on the Army at large, which will be more appreciated as time permits the working of the reforms initiated by them. Much still remains to be done, and it is to be hoped that a work so humanely initiated, and so ably advocated as this has been by some Military and Medical Officers, may be carried to a successful end.

The causes of heart diseases in the Army are—

1. Enlistment of youths at too early an age.
2. Ill adjustment of weights, and constriction of body and limbs from tight-fitting dress.
3. Syphilis.
4. Intemperance.
5. Overfeeding and malaria in tropical countries.

Firstly, as to the enlistment of youths at too early an age. Of all the causes of heart diseases just enumerated, this is one of the most fruitful, and it is one to be speedily removed. When we come to consider how the position, pay, pension, and general condition of the soldier has of late years been improved, it is manifest that the inducements to enlist are greater, consequently a better description of recruit should be procurable; therefore there is no apparent reason why, in time of peace, 21 years of age should not be fixed as the minimum age of recruits.

By a recent order, 5 feet 8 inches has been fixed as the minimum height of the Infantry recruit. This order shows plainly either that there is no lack of recruits, or that the vacancies to be filled up are few. Any way, there is very little doubt but that a better article is forthcoming.

To Dr. Aitken belongs the credit of having brought this matter forward, and claiming for it the amount of attention it deserves. In his introductory lecture at the opening of the course of study at Fort Pitt in April 1862, he clearly proved the injurious effects of subjecting an undeveloped frame to the fatigue and hardship of a soldier's life. So productive of disease and inefficiency is the enlistment of youths at too early an age, that it has been enumerated seventh in the list among the causes of disease in the British Army by Dr. Parkes.

At the age of 18 the skeleton is in the following incomplete state:—1. The lateral pieces of the sacrum begin to grow and coalesce; 2. The styloid process of the temporal bone grows; 3. The base and glenoid head of the scapula are completed; 4. The sternal epiphysis of the clavicle ossify; 5. The lower epiphysis of the humerus unites with the shaft; 6. The epiphysis on the lesser trochanter unites with the shaft of the femur; 7. The epiphysis of the head and of the tubercle of the ribs commence; 8. Completion of ossification in the lower epiphysis of the fibula (*Dr. Aitken*).

At the age of 21 years the skeleton is much more complete, the muscles are harder, the weight is greater—in fact there is a nearer approach to the "co-relation of age, weight, and development with strength" (*Dr. Aitken*), so necessary for the endurance of hardship.

"From the 20th to the 24th years the upper epiphyses of the tibia and "fibula unite with their respective shafts; the clavicle completes itself; the "occipital and spheroid bones coalesce; the third and fourth pieces of the "sternum unite; the bodies of the vertebræ and their epiphysal plates coalesce; "the wisdom teeth appear in the cavity of the mouth: in fine, the bones are "now gradually thicker, the joints stronger, the shoulders broader, the muscles "firmer, better developed, and more powerful."—(*Dr. Aitken.*)

Of the above changes the most important, as regards heart affections, are completion of the clavicle, union of the third and fourth pieces of the sternum, coalescence of the bodies of the vertebræ with their plates. Until these important events have taken place, there is no security against the soldier breaking

down under moderate hardship. The development of these bones is a good standard of body development generally.

There is a great similitude between the cases of the young soldier at the age of 18 years and the thoroughbred racehorse at the age of 18 months. It has been pointed out by several leading Veterinary Surgeons that the colt at that age may go through his training, but is extremely likely to break down in the race. The same may be said of the immature lad, who, when called on to endure the hardships of a campaign, has on too many well-known occasions lamentably failed, crowding the military hospitals, and embarrassing the movements of Generals. The First Napoleon complained bitterly on this subject after the battle of Leipsic. The Duke of Wellington, Sir De Lacy Evans, and His Royal Highness the Duke of Cambridge, with many others, have borne testimony as to the inefficiency of young soldiers in war.

Should it be considered necessary to enlist men under the age of 21 years, the proposal made by those who have proved themselves earnest promoters of the soldier's welfare ought to be adopted: namely, that men, or rather boys, of the age of 18 years should be kept for at least two years at light duty at a depôt, before they are sent to join the service companies. During this period it has been proposed to occupy the men chiefly in the gymnasium, where a judiciously conducted course of instruction would strengthen the limbs and invigorate the body, at the same time allowing those changes in the frame to go on.

Although 18 years has been fixed as the minimum age of the recruit, drummers and bandsmen excepted, it is well known that many boys under that age get into the Service, either from ignorance of their own age or by false statements, as all service before 18 years does not count towards pension. Therefore great importance ought to be attached to that "co-relation of age, "weight, and development" insisted on by Drs. Parkes and Aitken; "and if "either in weight or height, or both together, there is any great divergence "from the mean, then something wrong will probably be found."

It has been laid down by Dr. Parkes that "probably 62 inches at 18 years "of age, and 112 to 116 lbs. weight, should be a minimum even in times "of the greatest pressure." There is also no question as to the value of his suggestion, viz., "that the required height and weight at the respective ages "should be expressly named" in the Regulations.

The advantage of having no soldier in our Army under 21 years of age has been dwelt upon as tending to diminish losses from death and invaliding, not only from cardiac affections but from pulmonary and tubercular complaints (*Dr. Maclean*). It is perhaps better to defer pointing out at length how immaturity of frame is conducive to heart diseases among soldiers till the question of equipment and weights come to be considered, as they are inseparably connected in their action.

The second great cause of cardiac diseases in the Army is "ill adjustment "of weights and constriction of chest and arms by tight-fitting dress." Perhaps of all the causes before enumerated, none is so productive of misery, discomfort, and danger to the soldier as this. The day of the old pack, with its ingenious contrivance of belts, has fortunately gone by; and few will dispute its undoubted right to occupy a prominent place among the instruments of slow torture of the dark ages.

A short description of the old British pack will suffice. It is a square case fixed on to the back by two straps passing over the shoulders and fastened by two hooks at the lower extremity of the pack. The frame of the pack was made of wood. Each soldier had to depend on the assistance of a comrade to enable him to put on his pack, and, when once on, by no efforts of his own could he free himself from its company. For the sake of a smart look on parade, its discomfort was frequently increased by a stick fixed near the top of the pack, under which the straps went: this kept the pack from hanging too far back.

The pack and straps weighed 4 lbs., and the field-kit about 7 lbs. 12 ozs.: thus the case carrying his kit weighed a little more than half as much as the kit itself. The straps on each side, which supported the weight of the pack, rested on the clavicle, first and second ribs, and pectoral muscles; and where it passed under the armpit, the strap pressed on the axillary vessels and nerves.

During marching or other exercise with the pack on, the following were the consequences:—The act of inspiration was impeded, the exhalation of carbonic acid was thus lessened; the flow of blood through the lungs was retarded, a greater amount of work was consequently thrown on the heart; the pressure on the axillary vessels was conducive to the latter result.

Now to appreciate fully the constriction to which the chest walls were subjected, it is necessary to remember that the soldier in the field had in addition to carry:—1. A cross-belt and pouch containing 40 rounds of ball cartridge and caps: the weight of this was 5 lbs. 6¼ ozs. 2. A haversack with three days' provisions, weight 6 lbs. 8 ozs. 3. A water-bottle and water, weight 2 lbs. These three latter items come to a total weight of about 13 lbs. 14¼ ozs.; and as their effect is to produce constriction of the chest in an antero-posterior direction, the action of the chest organs was still more oppressed.

The total weights bearing on the soldier's chest, and restricting its action in the field, were as follows:—

	lbs.	ozs.
Pack and field kit pressing on clavicle, first and second ribs, pectoral muscles, and axillary vessels	11	12
Crossbelt and ammunition, greatcoat and blanket, constricting sternum and ribs antero-posteriorly	13	13¼
Haversack with three days' provisions, water-bottle and water, acting in same way	8	8
Canteen	1	5
Total	35	6¼

Of the above articles, the pack, field-kit, greatcoat, and canteen were carried in the most disadvantageous manner, that is at a great distance from the line of the centre of gravity. The nearer the centre of gravity of the body the weights are placed, the more easily are they carried; consequently, as "in a "man standing, the centre of gravity lies near an imaginary point in the "cavity of the abdomen, between the umbilicus and pubis, and bisecting a "line drawn from the centre of the third lumbar vertebra horizontally to the "anterior abdominal walls," it is manifest that the position in which the pack was carried, far removed from this point, was most burthensome.

At the time the soldier had to carry these weights he had generally to perform the greatest amount of work, while in the case of the navvy or other labourer, when at work, every extra weight or article of clothing is laid aside. These facts were fully pointed out in the year 1865 by a Committee assembled by Earl de Grey, constituted by Generals Eyre, Rumley, and Horsford, and Drs. Logan and Parkes. They clearly proved that discomfort and annoyance were not the only consequences of the mode of carrying the pack and equipment then (1865) in vogue, but that there could be no reasonable doubt of its being the prime cause of that excessive prevalence of heart and lung diseases in the Army.

The labours of this Committee extended over a period of about four years, and after numerous trials and careful investigation, their conclusions have come to light in the form of four Reports. The fourth and last Report, published about the end of 1868, contains the opinion expressed in the former Reports, viz., "that the principle of the brace system provides the best means for car-"rying the Infantry service kit with the greatest ease to the soldier"; and they think that the time has now come for adopting the valise equipment. It is after the principle of Sir T. Troubridge's valise, and consists of a waist-belt and frog, two pouches for twenty rounds each, a ball-bag containing loose cartridges to be used in rapid firing, a valise made large enough to hold the service kit, brace yoke, and coat straps, &c. The advantages of this arrangement are, that the weight is so distributed as to fall as nearly as possible on the centre of gravity of the body. The ammunition carried in front partially balances the valise behind, the weight of the latter being further distributed over the sacrum, the shoulders, and the waistbelt, leaving the chest entirely free; and, lastly, several pounds in weight to be carried were saved to the soldier. The ammunition pouches are to be made of soft leather. This equipment therefore offers no obstacle to the return of blood from the upper

extremities; the constriction of straps being removed, rapidity of firing too is facilitated; and the orthodox numbered fingers and stiff pouch will be henceforth a matter of history.

The Committee also recommended a lighter greatcoat with a waterproof cape to be worn separately or over the coat. A most important point connected with this equipment is that entrenchment tools can be carried with the valise arrangement. The utility of these tools are attracting considerable attention since the introduction of breech-loading rifles, more especially at the great French camps.

To the above Committee the soldier is indebted for a great boon, and it is to be hoped that their suggestions may be adopted throughout the Army; "that no more will be seen young men wandering about unfit for service as "soldiers or anything else, and that we shall hear no more of the milk-spot on "the soldier's heart."—("*Medical Times*," *vol. i.* 1867, *p.* 360.)

With regard to tight-fitting dress, it would be very desirable if the movements of the chest were not restrained by a tight tunic. When buttoned up in it, inspiration cannot be as full and complete as increased exertion necessitates. The collar of the tunic should be looser, but there would be no advantage in having it lower. The stock is an useless and uncomfortable appliance, which interferes with the movements of the neck, and retards the return of blood through the jugulars.

There is not, however, sufficient evidence to bear out the opinion of Mr. Myers, of the Guards, viz., that aortic aneurism is a sequence of a tunic tight around the neck and upper chest. His experiments with the spirometer ("*Lancet*," *20th Feb.*, 1869) have either been rendered unintelligible by a mistake in printing or are originally inaccurate. It is impossible to trace any direct connection between a tight tunic and "expiration," nor can it be conceived how a buttoned-up tunic is compatible with an "expansion" of upper thorax and upper lobes of lung. An opposite state of the thorax and lungs—namely, forced contraction and limited inspiration—is, I take it, a more certain result of any tightening across the chest.

To obviate this cause of heart diseases, a loose tunic might be introduced, of the same shape as the red serge coat worn in India. With regard to the smartness of a regiment on parade, there would perhaps be a shade of difference in favour of the tunic, that is in a regiment drawn up in line; but as regards rapidity of movement, daily becoming of more importance, the loose red serge or cloth coat possesses every advantage over the tunic.

In fine, with regard to this question, nothing can more forcibly point out the disadvantage of tightening up and constricting the movements of men who have at certain times to put forth their powers in great exertion than comparing Infantry soldiers with the sailors of the Royal and Mercantile Navies. The sailor has nothing to hinder the full action of his chest, neck, and arms; his clothing fits loosely and comfortably; and the result is that few classes of the population can go through, with the same ease, the great exertion that sailors at times undergo. In the same way navvies and other labourers, when at work, take very good care to lay aside every weight or article of dress at all likely to interfere with the free action of chest and limbs.

Contrast this with the young soldier taken perhaps from the plough: his chest, neck, and limbs, from being previously covered with loose suitable clothing, now come to be invested in clothing and equipment so tight that his capacity for work is greatly interfered with.

Some few years ago a Committee was appointed, by the Secretary of State for War, to enquire into the cause of the reduced mortality of the French Army in Algeria. The Committee consisted of Dr. Sutherland and several other officers. Their Report was most comprehensive and full of interest, and dwells on improvements in drainage, cooking, construction of barracks, hospitals, water supply, and dress; also in the Medical Service, and a more extensive use of quinine. How forcibly confirmative of Dr. Parkes's opinion on the subject of military dress is this one passage from their Report:—"Such a thing as a tight article of dress is not to be seen in the Algerian "Army."—("*Medical Times*," *vol. ii.* 1867, *p.* 504.)

Since the above was first written a change in the soldier's clothing has been ordered. A loose-fitting Norfolk jacket will be the soldier's dress on all ordi-

nary occasions and parades, the tunic being reserved for particular parades, &c. This is another great addition to the soldier's comfort.

Having thus endeavoured to point out the nature of the two first causes of cardiac diseases—viz., 1st. Too early enlistment: and, 2nd. Ill adaptation of weight and constriction of body by tight-fitting clothing—I will now try to illustrate their effects on the soldier.

The way in which these two causes of heart diseases act are so closely related one with the other that a separate description would not be advisable. The subjects of cardiac and pulmonary diseases in the young soldier are so intimately associated with regard to their causes, that I will have to dwell slightly on the latter diseases, though foreign to the subject of this Essay.

The above two causes of heart diseases in the Army bear their fruits at a very early period of the soldier's service—in fact just after great pains have been taken in teaching him his duty, drill, &c., and consequently when the State had been put to considerable outlay without having had scarcely any return from the soldier in the shape of service. Trustworthy statistics show that of the invalids who passed through the Military Hospital at Fort Pitt in any one year, 16 per cent. were recruits under two years' service, and that the greater part of that time had been passed in hospital.

In the year 1861-62, 34 per cent. of those invalided for tubercular diseases had not served three years; upwards of 44 per cent. of those invalided for heart diseases and diseases of the circulation had not served three years (*Dr. Aitken*).

Again, the eloquent and interesting lecture delivered by Dr. Maclean at the Royal United Service Institution, in the year 1864, "On the Influence of the "present Knapsack and Accoutrements on the Health of the Infantry Soldier," forcibly points out the appalling fact, viz., that in the year 1860-61, 2,769 men were discharged the Service: of these, 445, or 16·07 per cent., were under two years; and of these 445 discharges, heart diseases made up 13·7 per cent. In the year 1861-62, 4,087 men were discharged; 569 had less than two years' service, and of these 14·76 per cent. were lost to the service from heart diseases.

The value of these figures will be considerably raised when we take into account, as Dr. Maclean remarks, "that the invalids of the Guards, Royal "Artillery, and the troops serving in Ireland, are not included, as they were "not invalided at Fort Pitt."

The enlistment of immature lads appears to me to be the great predisposing cause, and the ill adjustment of weights and tight dress the exciting cause, in many cases of the break-down of young soldiers from cardiac and pulmonary diseases. At the age of 18, when a recruit comes under the drill instructor, his thorax is little better than a soft, yielding, elastic cartilaginous framework; the parts of the ribs (heads and tubercles) where they hinge on to the vertebræ are separate from the principal piece of the rib, having scarcely completed their growth; the bodies of the vertebræ and their epiphysal plates are also separate at that age. In front, the sternum is soft and yielding, consisting of four pieces; and superiorly the clavicle is incomplete. When, therefore, the weight of a pack (with kit probably) is brought to bear on this yielding structure, behind and in front, aided by the pressure of a crossbelt and tight tunic in front and superiorly, the result of these forces acting posteriorly, anteriorly, and superiorly (aided by a tight waistbelt limiting the descent of the diaphragm), will be to diminish the capacity of the chest in every direction, except a lateral one: thus, as a natural consequence, inspiration is restrained and the heart's action is embarrassed, first, directly from pressure in front; second, indirectly from the retarded flow of blood through the lungs, and the constriction of the axillary vessels.

Let us suppose that the above are the results when a man is standing at ease. Then take a recruit learning his drill; he has to carry his pack during several hours daily—a common practice formerly; the result to his heart and lungs must be most injurious; the elimination of carbonic acid being lessened, the lungs become congested, and hæmoptysis may follow. The heart struggles to propel the blood through the lungs in the augmented quantity required to compensate for the increased tissue-metamorphosis going on in the body.

It has been supposed that carbonic acid is produced by muscles when contracting; the heart too would form a greater quantity of $C O_2$ when its action

is hurried, and consequently would require a greater supply of arterial blood to renew its fibre; though the peculiarity of the coronary circulation affords the heart a copious supply of blood, still, when a sudden and violent effort is made, the increased supply of blood required not being forthcoming, its action will become irregular and weak; injury of its tissue must follow. This, if continued, is I believe a frequent cause of palpitation and intermission.

It has been shown by several experimenters that the respiratory movements of the chest are favourable chiefly to the systemic circulation, and to a less extent to the pulmonic circulation; expiration gives additional force to the arterial current, and this is not counterbalanced by the retardation of the venous current; the valves of the veins closing, limit regurgitation from the chest. On the other hand, the retardation of the arterial blood by the act of inspiration is less than the acceleration of the venous blood, because the orifice of the aorta is less than that of the venæ cavæ (*Donders*).

There is also no doubt but that a diminished volume of air reaching the air-cells will retard that "interchange of relations" going on between the venous blood in the lungs and the oxygen with which it is brought in contact; this interchange favours the onward flow of the blood: thus a tightened immovable chest in this way interferes with those "aids to the circulation," and consequently embarrasses the heart.

These signs of cardiac distress will be much more conspicuous the longer the exertion under the above conditions (heavy marching order) lasts: thus at the end of a long march, when a sudden effort is called for, the fatigued heart is unable to respond (*Dr. Parkes*); and it is very probable that many inveterate cases of palpitation, hypertrophy with dilatation, with cases of valvular disease necessitating invaliding, are thus produced. The above results have brought to my mind the truth of a description of military punishments said to prevail some years ago, in which the rhyme says,—

"The days of durance* twenty-eight,
"And pack drill with its crushing weight,
"Will sear his bloom."

Dr. Aitken truly observes, "that pressure on the chest from the front and "from behind, when the bones are growing, must tend to set the further "growth of the bones in an unnatural direction; the capacity of the chest from "side to side will be thus increased at the expense of the capacity in the "normal direction." Raising a heavy weight on an immature thorax, fixed as if in a mould, must act injuriously on the contained organs.

I have before stated that in civil life, among labourers, navvies, porters, &c., tight-fitting dress and constriction of thorax is unknown; the same holds good with regard to the Navy: hence, as Mr. Lawson has pointed out, aneurism is eleven times more fatal among the troops at home than among the male population of the same age; and affections of the heart are also more fatal, in the proportion of ·50 to ·45 per 1,000; and were those discharged from the Service on account of cardiac diseases retained until their cases terminated as in civil life, the ratio of mortality would be considerably higher (*Blue-book for* 1866).

Now as to a plan of prevention for these two causes of heart diseases, viz., too early enlistment and the influence of the pack. The latter is in a fair way of removal, since the new equipment, before described, is about to be adopted: thus each man will have his weights placed at the greatest advantage, whereby his heart and lungs, having their former restrictions removed, will be free to act, and the man's value will be greatly enhanced as regards powers of motion and general efficiency.

The first cause, and, I may add, *the* great cause of heart diseases in the Army still unhappily remains, and, as I have already pointed out, with the improved condition of the soldier and the inducements to enlist, I believe that men of the age of 21 years can be had in sufficient numbers to keep up our strength in times of peace. In war times, when pressure exists, the standard of age would in all probability have to be lowered; but never should the valuable maxim laid down by Drs. Parkes and Aitken be forgotten, viz., as to the necessity of having a certain "co-relation of age, weight, and stature"; and that should it be necessary to enlist men of the age of 18, that a period of

* Confined to barracks.

probation, extending over two years, would repay the outlay incurred, and fill the Army with men strengthened by gymnastics and careful training, and fully capable of resisting the hardships of a campaign.

I have gone through the hospital records of my regiment for the years 1862-68, and find that during these seven years the regiment lost 22 men by deaths and invaliding from diseases of the heart: of these 22 men, 8, or 36·36 per cent., were discharged under 5 years' service; 3 out of the 8 had 4 years' service; the remaining 5 less than 3 years' service. Of these 8 men, the disease of 6 was hypertrophia cordis; that of 2, morbus valv: cordis. There is no record of syphilis in any one of them nor of rheumatism. I quote these cases as undoubted instances of the break-down of young soldiers from the two great causes of heart diseases above mentioned. As to the ages of the above men, 7 out of the 8 cases were under 23 years of age; 1 was 24 years of age. Surely if such a loss as this occurred in a time of peace (4 years' home, 3 of Indian service), what might we expect to lose in the same period, from the same diseases, on active service in the field?

The third great cause of heart diseases in the Army is syphilis. Lesions in the organs of circulation are one of the most constant results of advanced constitutional syphilis. The system being contaminated by the syphilitic virus, a certain sequence of phenomena or changes in tissues, of more or less regularity, may be looked for, particularly in constitutions favourable to their operation.

The earlier manifestations of syphilitic poisoning—diseases of the skin and mucous membranes—from the pain or inconvenience they occasion, are likely to be noticed by the patient and recognized by the Surgeon; the same holds good, in even a greater degree, as regards advanced symptoms, diseases of bones, glands, &c.

Dr. Aitken has, with others, paid great attention to the changes wrought in the system, especially in the brain, heart, blood-vessels, lungs, liver, and testes, by constitutional syphilis. This disease, in fact, leaves scarcely any organ untouched, but goes on working destructive changes in tissues which in many cases attract little attention during life from their insidious course, or, if noticed, are referred perhaps to some other cause.

The *post-mortem* examinations of soldiers, when carefully made, reveal, in many cases, the fact that serious and destructive changes in the minute structure of some of the viscera have taken place.

There are few organs in the body more subject to destructive changes from constitutional syphilis than those of circulation. Not only the heart and great vessels adjoining it suffer from the syphilitic virus, but the altered states of many other organs are secondary to syphilitic changes in their minute arteries, as some diseases of the brain and spinal cord.

Dr. Aitken has shown that the important and interesting metamorphosis in some tissues, known as amyloid or albuminoid degeneration, is frequently found in connection with syphilitic cachexia. He enumerates syphilis as second in the order of frequency of the seven conditions with which amyloid degeneration has been found associated.

The primary changes resulting from, or induced by, advanced constitutional syphilis in the inner coat of the aorta are chiefly of three kinds, viz., (*a*) atheromatous collections of a granular material of a yellowish colour; (*b*) white or semi-cartilaginous-like patches; (*c*) a contraction or wrinkling of the inner coat. These changes have been minutely described by Dr. Davidson in the Blue-book for 1863. His descriptions, drawn chiefly from Virchow, point to an increase of the connective tissue of the inner coat; prolification of the cells of that tissue, with subsequent degeneration of the contents of these cells. This is the explanation of the first two conditions, (*a*) and (*b*). The third (*c*) morbid change, he states, is caused by the gradual contraction of the increased connective tissue overlaying a patch of degenerate material involving the middle coat.

There can be very little doubt but that these morbid states lessen the resisting power and impair the elasticity of the arterial tube, and are in many cases the forerunners of dilatation, bulging, and aneurism of the vessel.

Dr. Aitken has pointed out the frequency with which these losses of substance in the lining membrane or inner coat of the aorta are seen in the cases

of soldiers who have suffered from constitutional syphilis. Out of 26 *post-mortem* examinations made by him on soldiers with a syphilitic history, 17 presented either the characteristic loss of substance or dilatation of the aorta. Aneurism, also resulting from these changes in the coats of the vessel, was found in one of the above cases.

A case of aortic aneurism, resulting from syphilis, has been recorded by Dr. Lewer in the Blue-book for 1862; and in my own regiment I have seen three cases of aneurism of the aorta with well-marked syphilitic appearances. The three cases terminated fatally, and syphilitic deposits in the inner coat of the aorta and some of the viscera were found. These cases occurred since 1864. Two of these men were 37 years of age respectively, and were 17 and 18 years in the Service; the third was 33 years old, and had 14 years' service.

Constitutional syphilis appears to produce morbid changes in the endocardium, more especially in the reflections of that membrane forming the cardiac valves. These changes I have seen assume two distinct forms, viz., (*a*) a warty cauliflower-like growth on the free surface of the mitral and aortic valves, of a yellow granular material; (*b*) a contraction or puckering of the component parts of the above valves. During three years, 1866 67-68, in my regiment, five cases of distinct valvular disease of the heart have come before my notice; four of them ended fatally, and one was invalided. In the above five cases the patients had never suffered from rheumatism or any other disease likely to produce morbid changes in the cardiac valves. They all had been infected with syphilis; and at the *post-mortem* examinations of the four fatal cases, well-marked evidences of syphilitic ravages were apparent on the cardiac valves, the lining membrane of aorta, and the liver. Their kidneys were free from Bright's disease. The ages of these men ranged from 33 to 39 years, and their service from 10 to 21 years.

Another way in which syphilis leaves its impress on the heart is by the growth of gummata in the muscular walls of the ventricles. Dr. Aitken describes them as "firm, yellow, cheese-like masses" in the muscular substance of the ventricle.

A case of ulceration of the wall of the left ventricle, opening into the pericardium by an aperture about the size of a crow-quill, occurred in my regiment in May 1869. The patient never complained of any heart symptoms; he died suddenly one day in hospital, when recovering from an attack of malarial fever; he had suffered greatly from constitutional syphilis, having been constantly in hospital with it since he was infected. Whether this opening was the result of softening and ulceration of a gummatous tumour, or of ulceration beginning in the endocardium, is uncertain.

Having thus endeavoured to point out how syphilis is a potent cause of heart disease, I will next compare soldiers with civilians as to the prevalence of syphilis respectively among them. It is a task of great difficulty to arrive at any reliable conclusion on this point, no means being available for demonstrating by figures the prevalence of syphilis among the civil population of the soldier's age.

By a return of the number of recruits rejected as physically unfit in one year in the United Kingdom, and the causes of their rejection, I see it stated that from the small number of rejections from syphilis it may be inferred that syphilis is not more prevalent among civilians of the soldier's age than among soldiers. This statement may be considered as probable. It appears to me that the prevalence of syphilis, as well as its type, are to a great extent in a direct ratio with the style of prostitute found in a certain locality: the more miserable the "wren," the more chance of syphilis. Hitherto the soldiers' barracks were surrounded by these women, and I maintain that his chance of infection was thereby greater than the civilian.

The "Pall Mall Gazette" has given its able advocacy to the cause of these wretched women—prostitutes of the lowest grade, known as "wrens"—and has dwelt on their mode of life in the vicinity of the Curragh Camp. While serving in Ireland, and long previously, I had many opportunities of observing the character and general way of living of these women, than which nothing can be more revolting; and I am convinced, from personal observation, that not only at the Curragh, but also in the vicinity of every garrison town in Ireland at least, the stereotyped "wrens" abound, and are looked upon by the

population generally as "soldiers' women." Surely, from connection with these women, the soldier runs a greater risk than his civilian brother, who generally can afford something better, or is not debarred from marriage.

To remedy this state of things, a Bill "for the better Prevention of Contagious Diseases at certain Naval and Military Stations" came into operation on the 30th September, 1866, at which date the "Contagious Diseases Prevention Act" of 1864 ceased to be in force. The stations named were only three in number in Ireland, and eight in England. The working of these Bills hows the following results :—

In the Navy, in the first six months of 1864, before the Act was passed, the ratio of cases of venereal treated to 1,000 of mean strength was 130; whereas in the first six months of 1867, the ratio of cases treated to 1,000 mean strength was only 49.

Again, in the Army in 1864, before legislation, the annual ratio of admissions for venereal diseases, in the whole Army, was 290 per 1,000. This has been reduced at the inspected stations to 185 per 1,000; half of this was disease contracted out of these inspected districts.

The following Table, taken from the "Medical Times" of 28th November, 1868, points out the gain to the Army from this Act. With regard to the Army serving in the United Kingdom, the Table shows that in seven years the proportion constantly in hospital, from venereal diseases, has been reduced by nearly one-fourth; and the country has attained a gain equivalent to the service of the whole Army in the United Kingdom for nearly three days.

TABLE showing Reduction of Venereal Cases in the Home Army.

Year.	Rate per 1,000 Strength Admitted for Venereal Affections.	Proportion constantly Sick per 1,000.	Equal to Loss of Service of whole Army at Home for	Average Duration of Cases.
			Days.	Days.
1860	369	23·69	8·6	23·5
1861	354	23·45	8·5	24·1
1862	330	22·24	8·1	24·6
1863	307	20·28	7·4	24·1
1864	291	19·10	7·	24·
1865	283	18·06	6·5	23·30
1866	258	16·19	5·9	22·8

Whatever measures of Army reform may be passed in future years—enlistment for short periods of service in the Army, and then passing into the Reserve, &c.—one great measure of equal importance, both to the Army and the rest of the community, urgently demands settlement. I allude to the extension of the provisions of the last Contagious Diseases Prevention Bill to the general population of the United Kingdom.

Prostitution being on all hands considered an irrepressible vice, why should scruples long exploded stand in the way of a sanitary reform, in importance second to none that ever engaged public attention. This is perhaps foreign to he subject of this Essay, but as I have endeavoured to prove that syphilis is a powerful agent in causing heart diseases, I cannot lose this opportunity of adding my testimony in favour of the general extension of a measure so important to the well-being of the Army and the population at large.

Legalized organization is the only safe method of dealing with prostitution. The objections about the protection of vice, and interfering with the liberty of the subject, have both been ably met by Dr. Parkes; and subsequently the papers that have appeared in the "Pall Mall Gazette" leave nothing further to be said on this subject.

At a meeting held at Gravesend on the 8th April, 1868, under the presidency of the Earl of Darnley, for extending the Contagious Diseases Act to the civil population of that town, the following important evidence was given :—

The Rev. Mr. Bailey, Chaplain of St. Bartholomew's, and Honorary Secretary of the Chatham branch of the Association, said, "He would, as a clergyman, confine his remarks strictly to the moral side of the question. He could state that during the short time the Act had been in force at Chatham nearly forty women had been reclaimed, and were now leading lives of honesty and industry. It was remarkable, and at the same time most gratifying, to notice how many of the women, after having been for some time in contact with the Chaplain, Matron, and officers of the hospital, and subjected to the necessary discipline and order of a large establishment, became, if he might use the expression, more humanized," &c.

Dr. Cockburn, R.E., "pointed out how greatly the virulence of the disease had been modified in Chatham, all the severe cases being imported."

That disease not only has diminished, but also has become more mitigated, secondaries being rare, has been pointed out in a paper read at the Western Medical and Surgical Society, London.—("*Medical Times*," *vol. ii.* 1868, *p.* 543.)

In concluding this portion of the subject, I will quote the words of the Report of the House of Commons Committee on Contagious Diseases, just published (July 1869). The Report acknowledges that "though the Act has not been in operation more than two and a half years, it has already done much to diminish prostitution, to decrease disease, and to reclaim the abandoned." It recommends that several new stations should be brought under the operation of the Act, and the area around the present stations be increased from a five to a fifteen mile radius.

Action of Alcohol.

Pathologists for a considerable time have been inclined to think that continued intemperance in the use of alcohol, in the shape of spirits, exerts an injurious action on the muscular tissue of the heart, as well as on the innermost coat of the arteries. However, our knowledge of the physiological action of alcohol taken in health is not complete enough to warrant decided statements. It may perhaps be said that alcohol alters the molecular constitution of the muscular fibre of the heart, gradually changing the sarcous elements into fatty bodies, also causing a deposit of fat between the muscular fibres of the heart external to the myolemma. Thus it happens that a large fatty heart, presenting a pale yellow colour, and of abnormal softness in texture, is constantly met with in the *post-mortem* examinations of persons known to have been intemperate during life.

Beyond these few general statements it is not safe to go, so that I will defer other observations on alcohol as regards heart diseases, as well as the effects of over-feeding and malaria, till I come to describe their effects in the several countries where their action is most powerful.

The Home Army.

In the Army serving at home the amount of heart disease is very considerable, as will be seen by the following Table, compiled from the Abstracts in the Blue-books for five years, 1862-66.

Table showing the Mean Admissions, Deaths, and Invaliding from the following Heart Diseases—mean of five years, 1862-66—in the Home Army, the mean strength of which was of all arms 74,132.

Diseases.	Admitted.	Died.	Invalided.	Remarks.
Carditis	25·8	1·4	5·2	The number invalided is calculated for four years only, from 1863, there being no available returns previous to that date.
Pericarditis	23·8	3·	3·5	
Hypertrophia cordis ..	88·6	4·4	42·	
Morbus valv: cordis ..	225·	19·8	102·7	
Palpitatio	33·8	..	4·5	
Aneurismæ aortæ ..	11·	13·2	2·7	
Total	408·	41·8	160·6	

The proportion of cases of heart diseases is greatest in the Infantry, especially in the Depôt Battalions. This I attribute to the injurious effects of carrying the old knapsack, particularly in the case of recruits and young soldiers, whose osseous system is not fully developed. The tight tunic would no doubt cause constriction of the chest, and further embarrass the heart. The new equipment with the Norfolk jacket will, it is to be hoped, prove beneficial to the soldier in this as in other respects.

Night sentries in exposed places probably cause a certain number of cases of rheumatism which may lead to heart disease and consequent inefficiency. The number of sentries in exposed bleak garrisons and camps should be reduced to a minimum consistent with safety, so as to expose as few as possible in severe weather; such places as latrines, wash-houses, fives-courts and empty yards, &c., being left to take care of themselves.

Certain classes of the civil population, from the nature of their occupations, are exposed to greater vicissitudes of weather than soldiers—sailors, boatmen, fishermen, and labourers, for instance. The constant wet and cold to which they are exposed produces rheumatism and heart diseases to a greater extent than among soldiers; but it is difficult to obtain reliable information as to actual numbers, and statistics, unless entirely accurate, are to be avoided. However, it is highly probable that the cold and continued wet to which the above classes of the population are exposed must be productive of many cases of rheumatism, to which the well-housed soldier is less liable.

As to the relative frequency of heart complications in acute rheumatism, Drs. Watson and Latham state,—"Of those who suffer acute articular rheuma-"tism, not less than two-thirds suffer also some form of cardiac inflammation. "Of these forms, endocarditis is the least formidable and much the most "common, occurring nine times as frequently as pericarditis."

Dr. Fuller states that pericarditis occurs once in every 5·97 cases of acute rheumatism; and the Medical Reports of St. George's Hospital, London, give the percentage of mortality among hospital patients from diseases of the heart, during a period of six years: namely, from pericarditis, 34·8; from endocarditis, 9·19; from hypertrophy, 60·5; from dilatation, 52·1; from valvular disease, 24·5 (*Aitken's "Practice of Medicine," 5th Edition, vol. ii. pages* 599 *and* 610).

Out of every 100 deaths in the Army, diseases of the heart and vessels cause 6·23; mean of years 1859-62 (*Parkes' "Hygiene," page* 493).

From the foregoing figures it is highly probable that heart diseases are much more prevalent among soldiers than among civilians.

I have before endeavoured to show that soldiers in the United Kingdom are more exposed to syphilis than civilians; the remedy for this has been pointed out already.

The introduction of the valise equipment in place of the old pack, and the comfortable loose-fitting Norfolk jacket as a substitute for the tight tunic, have removed two powerful agents in the production of heart diseases. It will also be found that a diminution of pulmonary affections will follow the above reforms; and, as one of the leading journals expresses it, "The Army at large "is indebted to Eyre's Committee for its zealous and successful efforts on its "behalf."

Early enlistment alone remains as a cause of heart diseases among our young soldiers; the remedy for this has been pointed out previously.

Mediterranean Stations.

I have found it convenient to class all our garrisons in the Mediterranean together. There is very little difference in the prevalence of heart diseases on these stations from that in the Home Army, and what has been already said touching the Army in the United Kingdom will equally apply to Gibraltar and Malta. At Gibraltar, cardiac affections caused a considerable amount of invaliding, for which no good reason has been given. Diseases of the heart do not appear to be unusually prevalent among the civil population at these stations.

TABLE showing the Admissions, Deaths, and Invaliding for certain Circulatory Diseases among the Troops in the Mediterranean Stations. Mean of five years, 1862-66. Mean strength = 12,542.

Diseases.	Admitted.	Died.	Invalided.	Remarks.
Pericarditis	4·6	·4	·5	The number invalided is calculated for four years only. The Ionian Islands were not garrisoned in 1865-66.
Hypertrophia cordis ..	8·4	·6	5·	
Morbus valv: cordis ..	31·2	3·	23·	
Palpitatio	18·4	..	3·2	
Aneurismæ aortæ ..	3·.	2·8	1·6	
Total	65·6	6·8	33·3	

BRITISH NORTH AMERICA.

Heart diseases, it is said, are not prevalent in the North American stations. The healthiness of Canada and the other stations in the Command is well known; nothing remains to be said on this subject. Annexed is a tabular statement of the number of cases (annual average) of heart diseases in the Command.

TABLE showing Admissions, Deaths, and Invaliding for certain Circulatory Diseases among the Troops in British North America. Mean of five years, 1862-66. Mean strength for above period = 14,400.

Diseases.	Admitted.	Died.	Invalided.
Pericarditis	4·	1·	1·4
Hypertrophia cordis ..	6·	1·6	4·4
Morbus valv: cordis	32·	5·6	13·4
Aneurismæ aortæ	4·6	5·8	1·6
Total	46·6	14·	20·8

Dr. Parkes states that in 1860, out of every 100 deaths, diseases of the organs of circulation caused 18·19. In 1860, 6·06; and in 1862, 6·35 in the garrison of Canada: thus, with the exception of one year (1860), the proportion of deaths from these diseases is about the same as that in the Home Army.

BRITISH WEST INDIES.

Under the heading of diseases of the Circulatory system, the remarks to be made are few. There is no unusual amount of heart disease in this Command. Formerly, though intemperance prevailed to a frightful extent, there is no record of any corresponding prevalence of heart affections. This, it is supposed, is owing to some error in diagnosis, as alcohol habitually taken in excess undoubtedly causes morbid changes in the tissues of the heart. Organic heart diseases are said to be common among the black population; for this it is difficult to give a satisfactory reason.

TABLE showing the Admissions, Deaths, and Invaliding for certain Circulatory Diseases among the White Troops. Mean of five years, 1862-66. Mean annual strength = 1,771.

Diseases.	Admitted.	Died.	Invalided.
Pericarditis	·6	..	..
Hypertrophia cordis ..	1·4	·4	·2
Morbus valv: cordis	6·8	·8	3·8
Aneurismæ aortæ	1·	·6	·2
Total	9·8	1·8	4·2

ST. HELENA, THE CAPE OF GOOD HOPE, MAURITIUS, AND CEYLON.

The classification of stations given in the Blue-books has been adopted as most convenient. The present group of stations requires a more lengthened notice than the previous ones, owing to the great prevalence of diseases of the circulatory system at the Cape of Good Hope. This has been long observed by the Medical Officers serving at the Cape at different periods, and different reasons have been assigned by them.

Being fully aware of the obscurity and uncertainty surrounding this subject, I have consulted all the available returns and documents likely to throw light on the matter; and it is with reluctance that I have come to a conclusion somewhat different from that expressed by those Medical Officers who have had the advantage of personal observations of the diseases of the Cape.

Inspector-General Lawson, in the Blue-book for 1866, gives an interesting account of the subject. His statistics on the prevalence of aneurism of the aorta are conclusive as to the frequency with which that disease is met with in South Africa. Valvular disease of the heart is also common, and leads to a great loss from deaths and invaliding; and he is of the opinion that these diseases are on the increase.

He has noticed that among the fatal cases many presented no aneurismal sac whatever, a simple fissure, slit, or round opening being found in the centre of a softened patch in the arterial coats, which, permitting the escape of blood, caused death. Altogether seventeen cases of aneurism and simple rupture of vessels, and seven cases of valvular disease, are recorded by him; and his opinion is that phlegmonous inflammation of the coats of the artery at the point of rupture is the immediate cause of the giving way of the vessel, and that this inflammation, in many cases, terminates in the formation of an abscess.

In advancing this reason (phlegmonous inflammation and abscess), he explains away intemperance, pressure of knapsack, &c., which were supposed by some (Nicholson and Taylor) to be the causes of the prevalence of these diseases.

The previous history of the cases quoted by Mr. Lawson is deficient in many important details: thus in many of them no mention of previous syphilis is made, nor was the condition of the lining membrane of the arteries often noticed. In fact, the evidence of abscess is very doubtful. Intemperance cannot be the sole cause, though it may be a powerful aid to other causes; for intemperance is just as common in Canada, the West Indies, St. Helena, and other stations; and heart diseases, Mr. Lawson states, were as frequent among the temperate as among the drunkards at the Cape. It is very probable that active service during the Kaffir wars could not have had much influence, because circulatory diseases are just as common since peace was established; in fact these diseases are on the increase. The influence of the knapsack is excluded, as the knapsacks are always carried for the men on the line of march.

Mr. Lawson considers rheumatism the great cause of heart diseases and aneurism at the Cape; he states that rheumatic pains in the chest are fre-

quently brought on by exposure to currents of cold air when the body is heated. With due regard to his long experience, the following Table is added to show that rheumatism is by no means so frequent at the Cape as at other stations.

TABLE showing the Admissions for Rheumatism per 1,000 strength.
White Troops.

Order of frequency.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.
Stations.	Ceylon.	Bengal.	Madras.	Bombay.	Australia.	Cape of Good Hope.	Gibraltar.	Canada.	St. Helena.	Mauritius.	West Indies.
	75	74	65	63	51	41	38	28	26	25	22

This Table is compiled from Dr. Aitken's work. The Cape, it will be seen, takes the sixth place in the order of frequency of admissions from rheumatism per 1,000 strength.

Dr. Parkes gives a Table of admissions and deaths from diseases of the circulatory organs per 1,000 strength; and in it Australia comes second, giving 13 admissions and 2·34 deaths per 1,000; the Cape takes the first place in the order of frequency, giving 22 admissions and 1·58 deaths per 1,000. This is for the years 1859-62. The rate of invaliding for diseases of the circulatory system is also very high.

Therefore it is necessary to look for some other explanation for the frequency of cardiac cases at the Cape. Rheumatism *per se* cannot be the cause, as Ceylon, Bengal, Madras, and Bombay ought to give a greater number of cases of diseases of the circulatory system than the Cape.

Rheumatism and intemperance being excluded, it appears to me that syphilitic degeneration of the inner coats of the arteries may be the immediate cause of the rupture of vessels and aneurism, causing too valvular diseases. Intemperance would no doubt materially favour these morbid changes. I have therefore come to the conclusion that syphilis is the great cause of diseases of the circulatory system at the Cape. Venereal diseases are very prevalent at this station, giving, in 1859-65, a ratio of 234·8 admissions per 1,000, and in 1866, 344·9 per 1,000.

Again, it is usual for regiments returning from China and Japan to be quartered a certain time at the Cape to complete their tour of foreign service. The China and Japan stations have always been noted as furnishing an enormous number of admissions from enthetic diseases: in 1866, Japan gave 566 per 1,000. The type, also, of the syphilitic diseases at those stations is described as being the most virulent in the world.

An admirable account of syphilis in the Japanese seas is given in the Blue-books of the Naval Medical Department for 1865-66. Acting Surgeon Hadlow, of the "Conqueror," remarks, "that rheumatism, unaccompanied by any "form of skin affection or sign of constitutional disease, appears in 26 per cent. "of the cases recognized as non-infecting, and in 33 per cent. of the infecting "sores, being, in the latter class of cases, commonly associated with a more or "less ill-marked roseola-like syphilide, but in other instances appearing alone "without any indication of secondary infection."

This rheumatism is a fruitful source of invaliding in the Navy from these stations. It appears to me that sending regiments from these stations to the Cape contributes greatly to swell the list of admissions, deaths, and invaliding from diseases of the circulatory system at the Cape. As a natural consequence, numbers of the men arrive at the Cape with constitutions already shattered by

syphilis and rheumatism; the climate of the Cape then acts as injuriously on these men as the climate of hill stations in India on cases of some organic venereal diseases.

Thus I submit that syphilis, aided by intemperance, is the great cause of the excessive prevalence of diseases of the circulatory system at the Cape of Good Hope.

TABLE showing the Admissions, Deaths, and Invaliding from certain Diseases of the Circulatory System among the White Troops serving at Ceylon, St. Helena, Mauritius, and the Cape of Good Hope. Mean of five years, 1862-66. Mean strength for same period, 7,518.

Diseases.	Admitted.	Died.	Invalided.
Carditis	2·	..	1·8
Pericarditis	5·8	·4	1·2
Hypertrophia cordis ..	14·8	·8	5·2
Morbus valv: cordis	44·4	3·6	16·8
Palpitatio	7·8	..	2·8
Aneurisma aortæ	5·6	4·2	·8
Total	80·4	9·	28·6

As preventive measures, legislation for the examination of prostitutes is to be strongly recommended; also to reduce the consumption of spirits is much required. The plan of sending regiments direct to the Cape from England, and not from China and Japan, might be tried.

There is nothing particular to be noted as to circulatory diseases at St. Helena, Mauritius, and Ceylon. The civil population of the Cape do not appear to suffer much from cardiac affections.

The following Table will show the admissions, deaths, and invaliding from certain diseases of the circulatory system among the troops serving at the Cape of Good Hope. Mean of five years, 1862-66. Mean strength for five years, 4,218.

Diseases.	Admitted.	Died.	Invalided.
Carditis	1·4	·2	1·6
Pericarditis	2·4	·4	·4
Hypertrophia cordis ..	4·2	·4	·6
Morbus valv: cordis	30·4	2·4	9·6
Morbus cordis	5·	·6	2·8
Palpitatio	3·4	..	1·4
Aneurisma aortæ	5·	4·	·4
Total	51·8	8·	16·8

AUSTRALIA, NEW ZEALAND, CHINA, AND JAPAN.

Australia and New Zealand have given a high ratio of cases of diseases of the circulatory system, Australia giving 13 admissions and 2·34 deaths per 1,000 strength. This is easily explained by the fact that troops were constantly passing backwards and forwards to New Zealand, where harassing work on active service, and rheumatism, necessarily caused a good many cases of heart diseases.

The prevalence of diseases of the circulatory system in Australia is to be attributed to the large number of cases of rheumatism that occur, also probably to intemperance and the action of the syphilitic poison.

The climate of Australia being most healthy, and the diseases of the natives few, it is manifest that by lessening the causes of rheumatism, syphilis and intemperance, a corresponding decrease in the cases of diseases of the circulatory system might be reasonably expected. The barracks at Melbourne are built on a damp unhealthy site: this should be remedied. A measure somewhat similar to our latest "Contagious Diseases Prevention Bill" ought to be introduced into the colony, as a benefit to both soldiers and settlers.

Intemperance is very common among the troops in Australia. The regimental canteen system adopted there, although an improvement on the old system, is still open to many reforms. A good deal is to be said on this subject when the Indian Presidencies come to be considered. It will perhaps suffice to say here that a stop should be put to the sale of spirits, in any form, in all canteens in hot climates, light French and Hungarian wines being substituted. Beer, when not taken to excess, is a harmless drink for the soldier in climates like Australia—that is of the same average temperature.

Thus it appears that a few improvements in housing and clothing the troops, as well as exposing them to the vicissitudes of the climate as little as possible, with the adoption of the measures above mentioned, would lead in a short time to a great decrease in our losses from diseases of the circulatory system in Australia.

New Zealand.—As to New Zealand, the remarks just made with regard to Australia will equally apply. This station has given a high rate of admissions and deaths from the diseases in question, as will be seen by the following Table.

TABLE of Admissions and Deaths for Circulatory Diseases per 1,000 strength.

Years.	Admitted.	Died.
Mean of 1859–65	8·2	1·4
„ 1866	6·3	3·75

This has been attributed by the Medical Officers stationed there to accidents and severe exertion during the successive wars. Hardships, long marches, and the carriage of the knapsack and other heavy weights, have no doubt also been the cause of many cases of the diseases in question.

Rheumatism was very prevalent both in Australia and New Zealand up to the year 1866, and was most probably the result of exposure and fatigue. Australia gave 51 admissions per 1,000 strength, and New Zealand 37: that is the mean of the years 1859-65.

The enumeration of these causes of heart diseases will at once indicate the remedy. Since peace was proclaimed, the ratio of these cases will probably be decreased; and the late improvements in the dress of the Army, particularly the new cape, will lessen the effects of exposure.

Syphilis and intemperance alone remain as causes of circulatory diseases at these stations, with rheumatism: these causes, it is to be hoped, will be gradually removed by the remedial measures already pointed out.

The diseases of the native population are almost unknown, as the aborigines are becoming extinct rapidly. It is said that the settlers suffer little from cardiac affections.

China and Japan.—Diseases of the circulatory system are frequent at these stations, as will be seen by the following Table:—

		Per 1,000 Strength.	
		Admitted.	Died.
China	1859–65	9·6	1·24
	1866	10·4	1·15
Japan	1864–65	4·3	1·42
	1866	1·1	2·25

The European force kept at these stations being now small, lengthened details may be dispensed with. Rheumatism and syphilis, as before stated, are the great causes of diseases of the circulatory system at these stations; rheumatism gives 75 admissions per 1,000 strength in China, and the venereal diseases, especially syphilis, are the most virulent in the world. Intemperance also causes numerous admissions. These three causes or diseases, acting on constitutions enfeebled perhaps by malaria, produce an injurious effect on the circulatory organs.

Preventive measures, as regards syphilis and intemperance, should be forced on the Chinese and Japanese authorities; and improvements in barracks and hospitals are required, especially in the variable climate of Japan, where the clothing of the men requires great attention. The native population of Japan are described as being very sickly, the result of syphilis and intemperance. There are no certain means of ascertaining whether circulatory diseases are frequent or not among them.

TABLE showing the Admissions, Deaths, and Invaliding from certain Diseases of the Circulatory System among the White Troops serving in Australia, New Zealand, China, and Japan. Mean of five years, 1862-66. Mean strength, 10,371.

Diseases.	Admitted.	Died.	Invalided.
Pericarditis	4·6	·2	·6
Hypertrophia cordis ..	19·4	1·8	7·2
Morbus valv: cordis.. ..	30·8	6·8	9·4
Palpitatio	4·6	..	·8
Aneurisma aortæ	6·	6·8	1·2
Total	65·4	15·6	19·2

THE INDIAN PRESIDENCIES.

The losses by death and invaliding yearly, among British troops in India, from diseases of the circulatory system, form an important item in the list of diseases which thin the ranks of the European troops.

TABLE showing the Admissions, Deaths, and Invaliding from certain Diseases of the Circulatory System among the European Troops serving in Bengal, Madras, and Bombay. Mean of five years, 1862-66. Mean strength, 63,566.

Diseases.	Admitted.	Died.	Invalided.
Carditis	104·4	3·6	21·6
Pericarditis	45·4	2·8	7·4
Hypertrophia cordis ..	121·4	5·4	61·8
Morbus valv: cordis.. ..	253·8	24·6	98·8
Palpitatio	82·	..	13·8
Angina pectoris	25·	·2	3·2
Degeneratio cordis	4·6	2·8	1·8
Aneurisma aortæ	15·8	9·8	5·4
Total	752·4	49·2	213·8

The causes of this high ratio of cases of circulatory diseases may be stated to be—1. Rheumatism; 2. Syphilis; 3. Intemperance and over-feeding.

The admissions from rheumatism are numerous: thus Bengal gives 74 admissions per 1,000 strength, Madras 65 per 1,000, and Bombay 63 per 1,000.

These figures represent the actual yearly admissions, taking the mean of three years, 1860-62.

The causes of rheumatism in India may be said to be vicissitudes of climate, alternations of seasons, and the great diurnal variation of temperature in certain seasons and stations.

After the human body has been exposed to the exhausting heat of May, June, and July, the functions of the skin are at their maximum; then comes the damp and hot weather of the monsoon months; the air being loaded with watery vapour, and nearly stagnant, the evaporating and excreting functions of the skin are obstructed; to this add great diurnal variations of temperature, and a succeeding cold weather lasting three and a half or four months, and the causes of rheumatism may be said to be in perfection.

The great alternations from heat to cold, dryness to moisture, are very trying even to the recently arrived robust European, while to the exhausted and anæmic old soldier, probably broken down by intemperance or syphilis, their effect is slowly but surely destructive.

In the cold-weather months, the effects of the cold on Europeans and natives, at night and in the early morning, are most remarkable. This may be the result of the state of body deteriorated by previous long-continued heat, or it may be connected with some peculiar atmospheric state.

On Europeans, I can tell from personal experience and inquiries from others, the cold does not affect the extremities (fingers and toes) as the cold at home does, but it feels as if it went straight into the bones, although warm clothing is worn on the body, while the feet are only covered with the same kind of sock and boot worn during the hot weather, and the hands are uncovered, carrying a rifle or holding the bridle.

On the natives the cold appears to act as a powerful soporific: instance the familiar sight of natives on the line of march in the cold weather, lying asleep on the bare ground, with nothing but a piece of thin country-made blanket rolled around them, and scanty clothing on them; and this when the thermometer stands at the freezing-point, or a few degrees above it. During the cold-weather months, rheumatism is very common among the poorer classes of natives, caused no doubt by want of sufficient clothing: this leads to many cases of heart diseases. Those who are addicted to the free use of bhang or opium are, as a rule, sooner or later likely to become subject to cardiac affections of different kinds. The soldier is free from both these causes of disease; and when the Indian barrack project, at present being carried out, is completed, his comfort will be materially increased by dry and healthy buildings. The men should also be guarded from the great and sudden changes of temperature; and this is by no means an easy matter in some stations, as in parts of Scind and the Punjaub, where those getting up before sunrise find a sheepskin coat necessary, while white clothing and a topee are worn in the middle of the same day.

The men themselves now see the necessity of proper clothing, as, with very few exceptions, flannel is worn by them next the skin at all times of the year.

The drainage question is too lengthened for discussion in this essay: damp and badly-drained stations produce rheumatism without doubt. The same may be said of the practice of sleeping on the ground on the line of march: this should be discontinued, the men being each furnished with one of Maguire's hammocks to keep them off the cold and damp ground: this could be packed up in the bed, and thus carried without any trouble to the men on the baggage camels.

Syphilis.

The amount of venereal among the British troops has always been appalling. Generally, the proportion of venereal cases averages from 20 to 25 per cent. of the total sick, previous to the year 1864. At Bangalore and Roorkee it used to be up to 50 per cent. of the total sick, and at Dinapore 53 per cent. of the total sick. Dr. Maclean states that in the 1st Madras Fusiliers, a few years ago, the amount of syphilis was equivalent to the withdrawal from duty of one-fourth of a company daily (*Report of Indian Sanitary Commissioners*).

In 1860 the admissions for venereal were per 1,000 strength as follows:—Bengal, 345; Madras, 249; Bombay, 314. Latterly, at nearly all stations,

police regulations were enforced in an imperfect manner: the result was a very slight decrease in the above rates. I need not again dwell on the connection existing between syphilis and circulatory diseases.

To go then into the means to be adopted to lessen this scourge of our valuable troops, two classes of remedies have been proposed, namely: 1. Marriage and moral restraint; 2. Police supervision.

With regard to the question of marriage in the ranks, I regret that the view I take of the subject is opposed to the opinions of men of long experience in Army matters. It is that permitting soldiers to marry never can be a measure of much value for lessening venereal diseases in the Army; and when the soldier's period of service is limited to five years, as has been recently shadowed forth, marriage of private soldiers should be prohibited.

To speak of things as they are at present, although great changes have been made for the comfort of married soldiers and their families at home, it is evident that no soldier can properly or comfortably maintain a wife and children on his pay. The wife may contribute something to the family support, but that is a precarious resource. Then comes the misery and discomfort entailed by repeated changes of quarters. In all foreign stations, India excepted, the same holds good.

The estimation in which soldiers' wives are *held at home may be judged of* by the fact that a respectable girl *marrying a soldier is, as a general rule,* looked upon as an outcast by her *family, who will henceforth have nothing to* say to her. Several instances of this painful truth have come to my notice.

In India, where 12 per cent. are allowed to be married, the Government have done great things to promote the comfort of married soldiers. Separate and comfortable quarters (patcherries) are given them, each woman gets an allowance of 8 rupees a month, and each child 2 rupees. When sick they are admitted to hospital, and are given extras, &c., when necessary, without any charge. Notwithstanding all this, I maintain that marriage among soldiers is even more objectionable in India than at home, for the following reasons:—

Firstly, to keep 12 men out of every 100 free from venereal diseases, a fearful yearly mortality is entailed on the unfortunate women and children, averaging, in many stations, 90 per 1,000 in the case of the women, and the children die off at the rate of 160 or 170 per 1,000 annually.

There is no way of lessening this terrible sacrifice of life so long as troops are kept permanently in the plains. Soldiers will not allow their wives and children to be separated from them (and they are quite right, so far as the former are concerned), and sent off to the hills; and married men, when they have a chance of going to the hills with their companies for the hot weather, will not avail themselves of it, but, as a rule, try to get attached to a company remaining at the plain station, to avoid the expense and discomfort of moving. Such is the case in my regiment; although within 48 miles of a healthy and agreeable hill station, the married men will not go there if they can possibly help it, though the advantages of the climate have been pointed out to them. If the proposition of stationing as many troops as possible, safety considered, on the hills during the hot weather, and bringing them down to form large cold-weather camps, was entertained, then the married men might be left behind to garrison the hills, thereby giving their families the full benefit of these charming climates.

It is no doubt true that the married soldier with his family is far better off in India than in any other foreign station, and that married men, as a rule, volunteer to remain in the country. However, the question still remains,—in order to keep a small proportion of men free from one class of diseases, are we justified in exposing the delicate woman and tender child to the dread climate of India?

Even the children that survive are invariably a puny sickly race, unless sent off at an early age to an asylum on the hills.

I refrain from going into any details as to the encumbrance women and children are in marching, and providing for them during active service; or as to the financial aspect of the subject generally. To remedy the great mortality among the women and children, the hills should be more generally occupied, as it is well known that women and children especially thrive there.

Police Supervision.

This system has never yet been properly or fairly tried in India. Lock hospitals were introduced some years ago, and were conducted in such a loose manner that no decrease of venereal cases resulted: they were consequently abandoned. Medical police has again very lately been revived, a Lock hospital has been sanctioned in every station, and it is to be hoped that a decrease of venereal will result.

The Sanitary Commissioners truly point out that all measures of medical police would be much more easily carried out on hill stations. The advantage of lessening the amount of venereal diseases in India is evident, not only as regards circulatory diseases, but with respect to many other diseases that venereal or its treatment lead up to.

One great obstacle to the proper working of the new Lock hospital system in India is the fact that many soldiers contract disease from women in neighbouring villages, or from the Cooly women sent to repair and build barracks, female labour being cheap and common in India.

This will falsify returns of admissions for venereal, and to those unacquainted with these circumstances the new system will appear at fault. However, the same drawback is met with at home. When a regiment arrives at a protected from an unprotected station, the increase in the admissions from venereal is most remarkable.

That the Lock hospital system, properly conducted, is the most suitable for India is a fact admitted by so many that the few objections raised against it must be disregarded. To this system, occupying pleasantly or profitably the spare time of the soldier would be a powerful aid.

True it is that during eight months of the year, in most Indian stations, the soldier's time hangs heavily on his hands. Workshops, gardens, fives courts, theatres, and reading-rooms have been very generally introduced. Notwithstanding all these improvements, there are numbers of men in every regiment, generally speaking, who do not or cannot utilize these several ways of passing their time. To these men nothing remains but the "unrefreshing day sleep," very generally indulged in after a heavy mid-day meal with a pint of strong porter. For men of this class it is difficult to find a pastime; probably to teach them some trade would be generally successful, or to instruct them in some simple arts useful during a campaign, for which prizes might be offered, as they now are for gardens and soldiers' exhibitions.

Intemperance and Over-Feeding.

I have now come to the last of the causes of diseases of the circulatory system in India. The Report of the Indian Sanitary Commissioners, with the remarks of Miss Nightingale, and the telling passages in Dr. Parkes' work, have clearly demonstrated the injurious effects, in time, resulting from overfeeding and over-stimulating the body in a climate having the same annual range of temperature as India. So exhaustive indeed are the details given by the above, that to go over the arguments against the use of alcohol would be a mere matter of repetition. All are agreed that spirits are hurtful, and that indulgence in their use is fearfully prevalent in India.

It is a sad fact that intemperance is just as prevalent now, and that men can obtain an excess of liquor from the canteen, the same as in former days. In addition to this, since the new Warrant giving an increase of pay, &c., was issued, soldiers have more money at their disposal, little of which goes to the savings bank, or remains there for any time.

TABLE showing the Amount of Liquor, its Price, and the Hour at which it can be drawn by each Soldier Daily in India. (Sept. 1869.)

Kind of Liquor.	Quantity.	Price.		Hours of Drawing.	
		Annas.	d.		
Malt	1 quart ..	3 equal to about	4½	11 A.M. to 6·30 PM.	
Arrack	1 glass 2 ozs.	1 „ „	1½	7 P.M.	9 P.M.
Gin	1 „ „	3 „ „	4½	„	„
Brandy ..	1 „ „	4 „ „	6	„	„

TABLE showing the Pay each Infantry Soldier receives Daily in India.

	First Term of Enlistment, 1 to 10 Years.			Second Term of Enlistment, 10 to 21 years.		
	Annas	Pies.	d.	Annas	Pies.	d.
No good-conduct badge ..	7	6 =	11¼	8	2 =	12
1 „ „	8	2	12	8	10	13
2 „ „	8	10	13	9	6	14
3 „ „		..		10	2	15
4 „ „		..		10	10	16

Marksmen receive 1*d.* a-day extra.

Thus it will be seen that porter 1 quart, arrack and gin 4 ounces, are within the reach of a man's pocket daily. He can, if he wishes, take two glasses of arrack, and not take any gin, saving thereby 2 annas.

In addition to this, it is a well-known fact that country liquor is still sold in large quantities to the soldiers by natives, not so much in the bazaar as out in the country around the cantonments. A large wine-bottle full of this stuff can be got for about 3 annas, or 4*d*. The old custom still prevails: soldiers, when out for their morning or evening walk in the vicinity of their barracks, get this liquor, buried in holes in the ground, or given to them by a native concealed up to that moment.

It is certain that, notwithstanding all efforts to prevent it, a good deal of this liquor finds its way into the barrack-room, to be drunk off quickly at night when all the men are in bed, after the last bugle call. This is by no means an overdrawn account; and strong indeed must that constitution be that can resist the gorging with an excessive ration, washed down by one quart of porter (made strong for the Indian climate) and four ounces of spirits from the canteen, and finished off by a draught of country liquor—all this under a punkah with the thermometer at from 94° to 102°, at the same time that a minimum of bodily exertion is taken during the day.

I have seen the above state of things bear its legitimate fruit in several cases of men of my regiment brought dead to hospital, after having been found lying out in the jungle or on their beds in a state of coma; and in more than one instance a bottle containing a little country liquor has been found close beside them.

In the *post-mortem* examinations made on the above men, or on those whose intemperate habits were known to me, I have invariably observed that their hearts were enlarged, thickly covered with fat, and the muscle of a pale yellowish colour.

Dr. C. R. Francis, in a paper in the "Indian Medical Gazette," has noticed this fact. He states that fatty degeneration is a frequent cause of mortality in India, that it affects the private soldier more than the officer, that both are over-fed and over-stimulated, &c. He thinks that diminished function of the lungs (indicated by lessened bulk) is a frequent cause of the above degenera-

tion, and that the weight of the lungs of all Europeans dying in India is much less than the normal weight (*Vide "Medical Gazette," 15th August*, 1868).

To come now to the practical point of finding a remedy for intemperance in India and elsewhere in the Army. I have searched and read all available documents on this subject. That soldiers, either in times of war or peace, in hot or cold climates, are better without spirits, is admitted by all; that tea, coffee, and light wines are the best drinks for him is equally true: instance the Australian settler, the Arctic sailor, and several modern wars, where no spirits could be procured. Now comes the difficult question, how can you get or induce the soldier to take to these beverages and give up spirits?

To me it appears there is but one way—namely, putting spirits out of his reach: that is by selling no spirits at canteens, and by more stringent cantonment police arrangements; inflicting flogging and imprisonment, with an unsparing hand, on all who sell liquor, directly or indirectly, to soldiers.

Though libraries, reading and recreation rooms, are admirable institutions in their way, the soldier has too much spare time on his hands to be satisfied with their resources. So surely as he has money in his pocket, he will, if possible, have spirits; and there is no doubt whatever but that soldiers have a great deal too much money at their disposal in India.

It appears strange that the youth who, previous to enlistment, tasted liquor of any kind at intervals few and far between, should, on coming out to India, go in for his full allowance as if he had been accustomed to it all his life. The example and ridicule of comrades is the cause of this.

Let light French and Hungarian wines be sold at a cheap rate at first in canteens, in lieu of spirits; cider, too, has been suggested for India; let the police arrangements already indicated be tried; and by the aid of instruction, recreation, profitable amusement, and military labour, the moral status of the soldier being raised, we may hopefully look to the future to wipe away the stigma of intemperance from our Army.

Over-Feeding and Malaria.

In proportion to his work, it is an unquestionable fact that the soldier is enormously over-fed in India. I feel it unnecessary to dwell at length on this point, as the evidence contained in the Report of the Indian Sanitary Commissioners, with the remarks of Miss Nightingale and Dr. Parkes, contain all that can be said on the subject.

During the hot and monsoon seasons, the soldier eats exactly the same quantity of food as in the cold-weather months; whereas in the two former seasons, parades excepted, exercise may be put down as *nil*—dozing away or smoking under a punkah, or behind a kurkus tattie, varied by trips to the canteen, being the only exertion this repleted animal knows.

In the cold weather the ration is suitable, as the men then amuse themselves with various energetic games in barracks: cricket, fives, bowls, football, &c. Coursing too, and shooting, are indulged in by many men; and every encouragement is given in my regiment, and generally in India, to field sports.

It has been recommended to lessen the quantity of meat in the hot-weather months, and to substitute fruit as a part of the ration. This, no doubt, would be highly desirable, provided sufficient ripe fruit could be procured; this, however, would be a matter of considerable difficulty. Again, it is necessary to remember that the meat is poor and thin generally in the hot weather, so that it is not so nutritious as at other times of the year.

Over-feeding *per se* does not produce heart diseases directly, though it probably exerts a powerful influence in causing congestion of organs, and so obstructing the uniform flow of blood and the even action of the heart. This will be more perceptible in constitutions weakened by malaria. I have seen many cases of troublesome palpitation persistent day and night, but greatly aggravated every day, generally from 11 A.M. to 1 P.M., the hours at which the quotidian paroxysm used to come on.

Exposure for a number of years to malarious influences acts injuriously on the function of the heart. I have seen cases of severe remittent fever, in which,

after all febrile symptoms had disappeared, functional derangement of the heart continued for some time, requiring the removal of the patient from the malarious locality to the hills.

Conclusion.

Since this Essay was commenced, many changes and improvements have been made, all tending to increase the comfort, health, and efficiency of the private soldier, viz., the introduction of the new valise equipment, loose coat, and the proposed extension of the Contagious Diseases Act, in accordance with the recommendation of the Committee of the House of Commons.

Enlistment at too early an age, and intemperance, are the great remaining causes of heart diseases in the Army. To remove the former, let Army Medical Officers urge the matter; and surely their efforts will find a response in many influential quarters, from none, I imagine, more warmly than the members of the Knapsack Committee, celebrated alike for their labours and successes.

With regard to intemperance, there are good reasons for thinking that the improved condition of the soldier will attract a better style of recruit than the dreg of society formerly eagerly seized upon by the recruiting serjeant.

The extension of education, urgently needed, and religious instruction, will raise the moral tone of the masses, and lead us hopefully to expect that future years will see a British Army like unto that of Marlborough, in which "the sot and the drunkard were the object of scorn."

APPENDIX No. XVII.

ON THE TREATMENT OF POPLITEAL AND FEMORAL ANEURISM.

By J. Lamprey, M.B., Surgeon-Major, 67th Regiment.

The method of treating popliteal aneurism by means of instrumental or digital pressure has been much extolled by Surgeons because of the success attending it in many instances; nevertheless this treatment cannot be altogether relied on, as cases now and again do occur where the result is not favourable, and resort has to be had to the operation of tying the femoral artery, and this too frequently, because too late, without better results.

If we refer to the early writers on aneurism, we learn that the Surgeons of former days succeeded in curing this most formidable disease by pressure likewise, though applied in a manner different to what is now practised, and that in cases where they had recourse to tying the femoral artery, the operation was frequently unsuccessful. Unfortunately, this also is the experience of our modern Surgeons, as cases now occur where, under the most favourable circumstances and in the best of hands, not only has pressure been tried without success, but the subsequent operation of tying the femoral artery has also failed to arrest the disease, and amputation of the limb has to be had recourse to as the only means of saving life. (*See* the notice of cases of popliteal aneurism which have recently occurred in University College Hospital, under the care of Mr. Erichsen, and published in the "Lancet," No. 8 Vol. II., August 20, 1870).

The experience of two cases of popliteal aneurism and one of aneurism of the femoral artery within the last few years, in each of which cases I tried the method of treatment by pressure without success, has been the occasion of my giving this subject some consideration.

The cases of popliteal aneurism being already recorded in the "Army Medical Reports," Vol. VIII., pp. 553, 554, it will suffice to state that in both these cases (Cottrell and Quohane) pressure on the upper part of the femoral failed to prevent the access of the circulation to the aneurism by means of the collateral branches, neither was a ligature which was put on the femoral in one of the cases more fortunate. The disease took its usual course, and amputation of the limb was performed in both individuals. Both these cases were most promising ones for the trial of the treatment by pressure, being taken in hand at a very early stage of the disease, while the aneurismal tumour yet collapsed on pressure being made over the upper portion of the femoral artery, and were placed under most favourable circumstances for carrying out all necessary details with unremitting attention.

The third case which has come under my notice where pressure was applied in the early treatment of the disease, was a case of aneurism of the femoral artery. In this instance an attempt was made to tie the artery above and below the sac without success, and eventuated in amputation of the limb.

Private W., 10th Hussars, aged 28 years, service 9 years, was admitted to the Military Hospital at Newbridge on the 18th of February, 1868, having a painful pulsating tumour, about the size of a walnut, situated on the inner aspect of the left thigh, at about the junction of its middle and lower third. He received a severe kick in the situation of the tumour while in the act of shoeing a horse about ten days before his admission.

There was no difficulty in detecting the nature of the tumour, as its pulsation, which had the characteristic expansive feel of an aneurism, at once

ceased on pressure being made on the upper part of the femoral artery, and its dimensions diminished, both which were restored on removal of the pressure; moreover the loud bruit that was audible on applying the stethoscope left no doubt as to what it was.

He was at once put under the treatment by pressure, both digital and instrumental, by means of Read's and Carte's apparatus, which were most assiduously applied, and every attention was given to his diet; but although solidification of the contents of the sac took place, the tumour, instead of becoming stationary, gradually increased in size, so much so, that at the end of six weeks it had attained to very large dimensions, and some œdema of the limb set in.

On the 17th of May, 1868, the large amount of swelling and hardness of the upper and inner part of the thigh, extending as far as the nates, made it evident that the aneurism had become diffused; pulsation could also be detected in the tumour, and he had had excruciating pain in it. The limb was warm, and not œdematous, and his bodily health was not impaired much, considering the length of time he had been confined to his bed.

On representing the man's condition to Surgeon-Major Fraser, of the 10th Hussars, who was then on the sick list, he fully concurred in the inefficiency of the pressure treatment and the advisability of adopting the alternative of permanently securing the artery by operation. The operation proposed to be performed had already been determined on, and would have been undertaken by him had the man been willing to submit to it. It was intended to cut into the aneurismal sac by one long incision from end to end, to empty out its contents, and to secure the artery above and below it by means of acupressure needles and ligature wire. It was agreed that the sooner the operation was done the better, and that as the 10th Hussars were leaving for England there would be less risk in removing the man to the hospital at the Curragh Camp than to Dublin. He was accordingly conveyed to the Hare Park Hospital, and on the following day (9th May) the man having given his consent to undergo the operation, he was placed on the table. The left thigh was allowed to retain the same semi-flexed position he had been accustomed to for some time previously, and so soon as he had been put well under chloroform, an incision about eight inches long was made into the tumour in a line corresponding with the original course of the femoral artery. At a depth of about half to three-fourths of an inch the contents of the sac were reached, and on removing the fibrous structure and clots, together with some soft whitish coagula forming the contents of the sac, a gush of arterial blood welled up from the lower part of the sac. The hæmorrhage was, with great difficulty, restrained by placing a tourniquet round the limb below the tumour and increasing the pressure above with considerable force.

The loss of blood was very great and sudden, and an alarming syncope was produced. It was at once determined to amputate the limb, as the only resource left to save the patient; accordingly, without loss of time, a circular incision was made corresponding with the commencement of the upper third of the thigh, and as this had to be done as speedily as possible on account of the hæmorrhage, which was not completely restrained notwithstanding all the compressing force employed, one clean sweep was made to the bone, which was sawed off as high up as the nature of the incision would admit. The object of this haste was to lose no time in securing the arteries.

The surface of the bone was roughened and easily admitted the muscular attachment to be separated from it where the tumour was in proximity. There was much softening of the muscles approaching to disintegration, and large clots of extravasated blood were withdrawn from among the muscles as far as the lower margin of the gluteal region, on the posterior and inner portion of the upper part of the thigh, and a large artery, apparently the *profunda*, was here found embedded in softened muscular tissue. It was still bleeding notwithstanding the pressure on the femoral artery, but was secured by means of an acupressure needle and ligature wire. The other arterial branches were secured in a similar manner. The femoral artery, which had been much displaced from its original channel by the growth of the tumour, was secured by passing a large curved suture needle underneath it, and placing a ligature wire in figure of 8 form above it; this was done without exposing the

artery, the needle was inserted in the integuments, about two inches below Poupart's ligament on the outside of the artery, passed underneath it, and made to appear through the integuments on the inside of it; both extremities of the needle remained exposed, while its curvature embraced the artery.

Pressure was now removed gradually and cautiously to ascertain the subjection of the arterial hæmorrhage; this was found to be satisfactory. A solution of carbolic acid, diluted with water to 1 in 60, was applied to the cut surface, which was also exposed to the air for a short time, the edges of the wound were approximated partially by suture, and dressings of lint wet in the carbolic acid solution were applied to the stump.

A dissection of the aneurismal sac in the amputated limb showed an abrupt termination of the healthy portion of the artery into the upper part of the sac corresponding with Hunter's canal. From 3½ to 4 inches of the artery below the internal surface of the vessel was made very irregular by several imperfectly formed *cul de sacs*. The character of an inner surface of an artery was most preserved at the side nearest the bone, and in about the middle of this portion an opening of a branch artery was found large enough to admit a No. 6 catheter; its course was upwards in the direction of the deeply-seated artery, probably the *profunda* first secured in the operation. This artery must have communicated with branches of the internal iliac, since compression of the upper portion of the femoral artery at its commencement did not prevent its bleeding, and it may be inferred that it was from this artery that the hæmorrhage chiefly took place when the aneurismal sac was cut into and rendered treatment by pressure as well as the proposed operation so abortive. The lower portion of the femoral artery was pervious throughout its course on to the popliteal. The capacity of the sac when cleansed of its contents would admit the bulk of a shut fist.

Progress of the Case.—During the night of the operation there was considerable oozing of blood from the wound, so that it was necessary to increase pressure over the femoral artery by compressing the pad of the Carte's apparatus, which was allowed to remain on the thigh instead of a tourniquet; this arrested the hæmorrhage. The usual amount of spasmodic twitching was felt in the stump, and the patient suffered much from irritability of the stomach; notwithstanding this, reaction became fully established, and he improved daily.

On the 20th of May, the eleventh day after the operation, it was decided to remove the curved needle inserted to secure the femoral artery, although much pulsating impulse was manifest about the part, and especially seen on the projecting extremities of the needle; it was withdrawn without any difficulty, and no hæmorrhage ensued. The wire applied over the artery was removed the following day. The needles securing the branch arteries were subsequently withdrawn, together with all the ligature wires excepting one which got entangled in the flesh and remained for some time longer. The man gained wonderfully in strength every day. The stump healed rapidly under the use of carbolic acid dressing, and on the 19th day after the operation he sat up in his bed for most of the afternoon, and ultimately made a good recovery.

It may be inferred from the study of these cases that reliance is not to be implicitly placed on the application of continuous pressure on the femoral artery in the treatment of femoral or popliteal aneurism, nor yet on the ligature. Why is this? A reference to the anatomy of the lower extremity, by which we are instructed that a free anastomosis exists not only by means of branches given off from the femoral at the beginning of its course, such as the *profunda*, but also between these and branches derived from the internal iliac and with the recurrent arteries from the lower portion of the femoral, frequently most irregularly distributed, will not explain it, neither will the fact that these collateral branches become rapidly dilated when called upon to carry on the circulation when impeded in the main arterial channel, so that however securely the circulation may be arrested in the upper part of the femoral artery, the lower portion being still permeable, the circulation may continue through it, and so have access to the aneurismal sac, be sufficient to account for it, as all these conditions apply equally to those aneurisms which are cured by pressure or ligature.

The first who has endeavoured to explain the reason of the failure in the

treatment of these cases is Inspector-General Lawson, who infers from a close observation of the progress of these cases and an examination of the appearances of the artery at the seat of the aneurismal tumour, that there is no proper aneurismal sac formed in the first instance after the injury has been done to the artery, which being torn transversely or in a line with the course of the artery, the margins of the rent are abrupt and do not gradually become continuous, as in the normal aneurism sac, in the manner usually observed; and that in such a case of ruptured artery, the extravasated blood may become circumscribed in a sort of sac simulating that of the normal aneurism arising from disease of the coats of the artery, but that in such a sac these changes in the consolidation of the tumour which are necessary to the cure of the disease when pressure is applied to the artery do not occur; on the contrary, the blood contained in these irregularly-constituted sacs necessarily acts as a foreign body and interferes with those curative changes which should take place in the artery in the vicinity of the wound. These views are set forth in his able paper "On the Causes of Aneurisms among the Troops in South Africa," published in Vol. VIII. of the "Army Medical Department Reports," where he says, in allusion to the case of Cottrell and Quohane, at p. 554: "There "being no sac the blood effused into the surrounding tissues, acted as a foreign "body, and prevented the repair of the breach in the coats of the vessel, and "on the establishment of the collateral circulation in the latter, hæmorrhage "again took place in the manner long ago described by Mr. Guthrie as "occurring in cases of divided arteries tied at a distance from the seat of "injury, instead of both ends being secured in the wound itself. When a sac "has been formed, the neighbouring tissues remain in a comparatively healthy "state, and either pressure or ligature may give time for the consolidation "of its contents, which the weak collateral circulation is not then able to "disturb." And again, in a more recent paper, "On Aneurism and Diseases of "the Heart at Aldershot, published in Vol. X. of the 'Army Medical "'Department Reports,' in alluding to this subject, he states as follows:— "When the arterial coats have given way by a rent and the blood is effused "into the neighbouring parts without the intervention of a sac, the chances of "a cure, unless the artery itself be secured both above and below the part, are "extremely small." In this paper he records two cases of popliteal aneurism successfully treated by pressure at Aldershot in 1868.

It must be a difficult matter, if not impossible, to determine with precision what is the real condition of the artery in these cases, and what may be the condition of the sac in the earliest stage of the disease; the mere fact of the tumour collapsing on pressure being made over the femoral artery and again resuming its original dimensions and pulsating character on the removal of the pressure, usually found to be the case, and its being circumscribed, ought to be sufficient to imply the existence of a sac, at all events. Still this sac, supported as it may be by the strong facia, may not be sufficiently organized to resist the force of the collateral circulation, and the growth of the tumour must be the consequence.

Fortunately, according to the views of the eminent pathologist Rokitansky, a sac of an adventitious character may sometimes be capable of fulfilling all the functions of a regularly formed one, and hence some cases of popliteal aneurism, although referrable to an injury, may recover by the pressure treatment. In the cases of Cottrell and Quohane, the disease was no doubt due to traumatism, a blow over the artery in one case and a strain in the other was the origin of the disease, just as in most cases of popliteal aneurism we find the disease is traceable to similar kinds of injury; for instance, we find the older writers remarked that the subjects of their cases were mostly coachmen or postillions, and in a case of this disease successfully treated by pressure, recorded in Vol. IX. of the "Army Medical Department Reports," p. 317, the disease appears to have originated from a strain while playing at football; in another case of successful treatment by pressure, the disease occurred in a man of the 10th Hussars who received a severe fall from his horse. Whether there was a rent of the coats of the artery in each of these cases and an adventitious sac formed, it would be a difficult matter to determine where the disease was cured. This, however, need not prevent us from adopting the best course to take in cases where the disease is distinctly traceable to an injury

of the artery. In such cases the proper course to adopt would be before the tumour had attained any considerable increase of size, to secure the artery immediately above and below the tumour, just as Guthrie has taught us to do in cases of wounded arteries, and as Inspector-General Lawson advises, and to open the sac not only for the purpose of giving an exit to its contents, but to secure any branch artery that may by chance open into it. The necessity for this proceeding is shown in the case of femoral aneurism I have just deatiled.

The most favourable time for arresting the growth of the tumour of an aneurism by ligature must be in the earliest stage of the disease, while it is no larger than a walnut or an egg. In this stage it is most usually brought to the notice of the Military Surgeon, when it is most favourably circumstanced for treatment by pressure; but while giving this mode of treatment at first a fair chance, which the success that has attended it in some instances fully warrants, the time for applying the ligature under most favourable circumstances should not be needlessly allowed to elapse. The facilities for securing arteries with little risk now available, by using the acupressure needle and ligature wire, ought to make the operation a successful oue, and more reliable than the method of treatment by pressure.

In the early stage, while the aneurism is yet small and the surrounding tissues are healthy, there need be little apprehension of extensive suppuration in opening out the sac, which is a necessary proceeding considering the likelihood of the existence of an irregular branch artery opening into it, and if so, of securing it; while opening out the sac, will obviate the risk of its contents exciting suppuration.

An important reason for securing the artery below the aneurismal tumour as well as above it is, that having, in the first instance, applied pressure to the main artery, the collateral circulation has been more or less fully established, and a free access of the circulation may continue to the tumour although the artery above it may be rendered impervious.

Should the aneurism not be brought to our notice till it had considerably advanced, or had become unmistakeably diffused, no reliance can be placed on any operation short of immediate amputation. In such a condition of the disease the collateral circulation must be considerably impeded, and, as in the hands of the older Surgeons who have opened out the tumour, suppuration from so extensive and badly-circumstanced a wound must have an unfortunate result.

APPENDIX, No. XVIII.

CASES.

1. *A Case of Popliteal Aneurism treated by Pressure on the Femoral Artery. Reported by Pierce G. Power, A.B., M.D., Assistant Surgeon 74th Highlanders.*

Private D. G., a healthy-looking man, aged 24 years, a mess waiter, was admitted into hospital on the 3rd February, 1870, with a pulsating tumour about the size of an orange in his left ham. He states that about 12 days previously he for the first time felt a slight enlargement behind his left knee-joint; on the 31st of January it caused him pain and numbness in the foot after walking. The tumour gradually increased in size till he presented himself for admission into hospital.

7th Feb.—The pain in the knee is less, and he feels easier in consequence of rest in bed. In the evening his foot and leg were bandaged with a flannel roller, the knee was supported on a pillow, two arterial compressors were applied over the course of the femoral artery, to be tightened alternately, viz., Hoey's compressor just below Poupart's ligament, and Signoroni's 4 inches below it. On being tightened, either compressor diminished the pulsation in the aneurismal sac, and could be made to stop it completely; they were kept on for about two hours and a-half, and he got an anodyne draught.

8th Feb.—The aneurism has diminished considerably in size, and the pulsation is less in it. He bore the compression very well last evening, but felt a numbness in the leg. This morning his foot and leg were bandaged, supported on a pillow, and the compressors re-applied.

9th Feb.—The compression was kept on yesterday for an hour in the morning and for an hour and a-half in the evening. The pulsation is less in the aneurismal tumour, and it is something smaller; he got an anodyne draught at night.

10th Feb.—The compression was kept on for an hour and a-half in the morning and for three hours in the evening yesterday. He slept well last night and feels easier. He can now tolerate the compression very well.

10th Feb.—The compression was kept on for about the same time as on the day before; he slept well, and complains of no pain in the leg.

11th Feb.—The compressors were on from 9 o'clock to 10 o'clock A.M., from 1 o'clock to 4 o'clock P.M., and from 5 o'clock to 8·30 o'clock P.M. He slept well, and the aneurismal tumour is diminishing.

12th Feb.—He kept the compressors on nearly all day. The pulsation in the tumour ceased during the night.

13th Feb.—The aneurismal tumour is much smaller, and there is no pulsation in it. He now perfectly understands how to apply the compressors himself, and how to tighten them alternately.

14th Feb.—There is no pulsation whatever in the tumour, and its contents are solidified. He feels easy in every respect.

22nd Feb.—The tumour has diminished considerably in size. He is up and able to walk about; he has ceased to use the compressors.

8th March.—Some mercurial liniment was rubbed over the tumour, which is now quite hard.

18th March.—A small hard tumour can still be felt in the left ham; the artery is probably completely occluded. Discharged from hospital.

Remarks.—Two compressors were used, and alternately tightened, so that the pressure should not be continued too long over the same spot. The object in view was to retard the current of blood through the artery by moderate pressure. As it is now known that diminishing the current of blood is sufficient, in most cases, to promote the coagulation and solidification of the

contents of the aneurismal sac, a patient who could only for a few minutes bear pressure that would stop the circulation through the artery, may be able to bear moderate continued pressure for a long time, which would suffice for his cure.

The pulsation in the aneurism ceased five days after the pressure was applied over the artery.

Continuation of the Case.—3rd August, 1870.—A slight fibrous thickening can be felt in the course of the popliteal artery, and he occasionally feels a little numbness about the knee: the artery seems to be completely occluded. He was discharged from hospital on the 18th March, and is at present employed as an officer's servant.

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2. *and* 3. *Two Cases of Arterial Hæmorrhage, with Remarks.* *By Staff Assistant Surgeon F. P. Staples. Netley.*

1. Serjeant S., No. 7 Company 1st Battalion 19th Regiment, consulted me in 1864 at Jullunder, East Indies, for a tumour situated about half an inch above the left eyebrow. He was about to leave the Service at the time, and said he wanted the lump taken away before his return to civil life to avoid having to pay for the operation. The tumour was somewhat less than a pigeon's egg in size, adherent to the periosteum, and apparently of a steatomatous nature, and was removed with very little dissection.

The edges of the wound were brought together with a few sutures, and as everything appeared to be going on favourably I left the patient in charge of the Hospital Staff.

In about half an hour afterwards I received a note from the Regimental Apothecary, summoning me to the hospital, and saying that the patient was dangerously bleeding.

When I arrived I found a steady stream issuing from the wound, and an enormous clot occupied the original position of the tumour, and the Apothecary reported that the usual styptics had been applied without the slightest effect upon the hæmorrhage.

I turned out the clot after cutting the sutures, and having sponged out the wound, began to search for the bleeding vessel, in order to place a ligature upon it; in this attempt I was unsuccessful, although I could see plainly the spot from whence the blood issued.

Seeing that there was no chance of controlling the hæmorrhage by ligature, I then tried with an ordinary forceps to tear the periosteum surrounding the vessel in hopes that I might do so by torsion, but in this I was also disappointed.

Pressure with a graduated compress over the course of the supraorbital artery was next tried with no better result; but as I was aware that it must be either from that vessel or from a branch that the hæmorrhage proceeded, I placed my thumb-nail beneath the eyebrow and made firm pressure upon the vessel as it emerges from the superorbital foramen, and found that by this means I was able effectually to control the bleeding. I kept my finger in this position until the Apothecary manufactured a piece of cork, by means of which and a common roller continuous pressure was kept up. There was no more bleeding, and the wound healed in the usual time bygranulation.

I consider the above case worthy of record as an example of a dangerous hæmorrhage following a very simple operation, and as an illustration of the difficulty which may be experienced in controlling bleeding from a wounded vessel when the latter has retracted,—as I imagine was the case in this instance—beneath a dense and unyielding structure, and when it appears to me doubtful if the actual cautery would have reached it.

2. Serjeant N. H., was under my treatment in September 1867 for erysipelas of the head and face. The disease followed a contused and lacerated head wound, about 2 inches in length, which was situated near the mesial line and partly in the forehead and partly in the hairy scalp. It took on an unhealthy action from the beginning, and about the eighth day the entire left side of the head was involved in diffuse cellular inflammation.

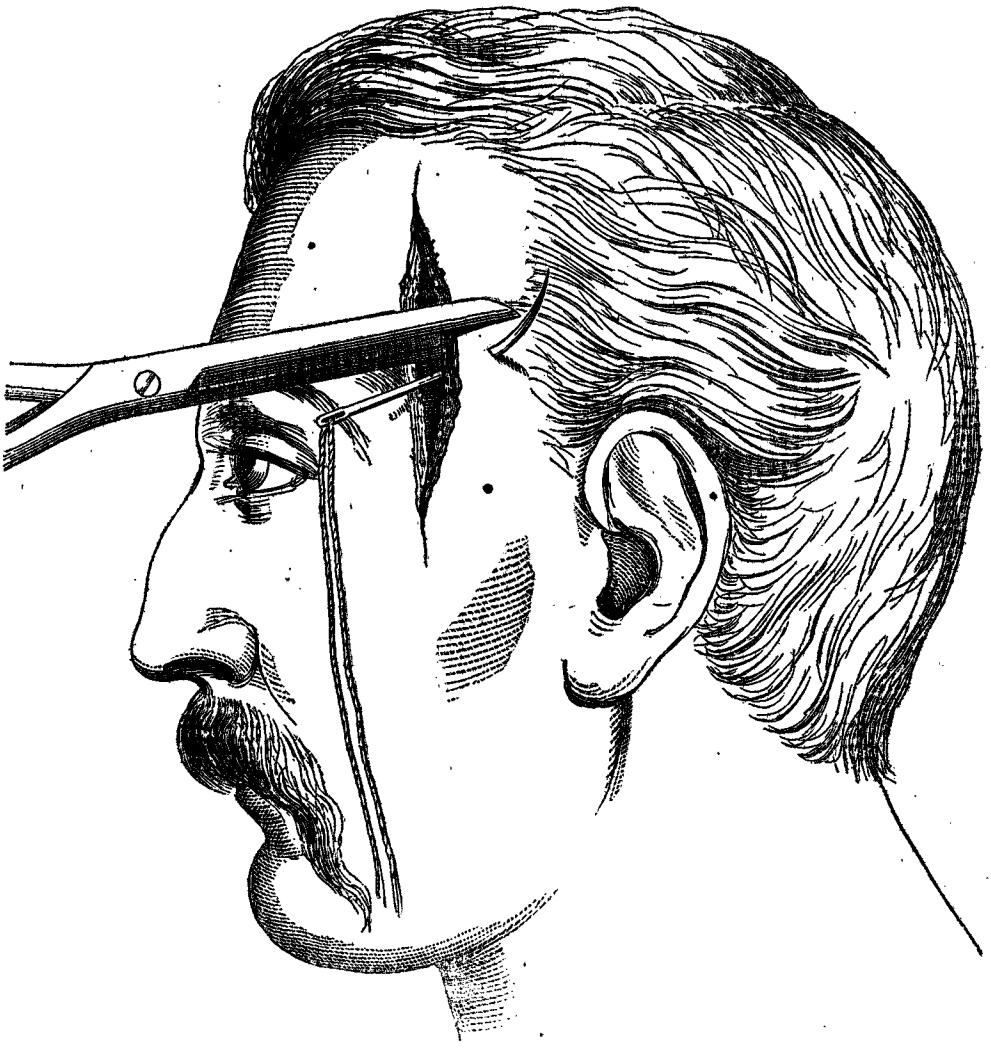
There was extensive œdema, and evidence of a large collection of matter having formed beneath the temporal aponeurosis.

I evacuated the latter with an abscess lancet, making the incision inferior to the course of the anterior branch of the temporal vessel. Two days afterwards I found on examining the wound that the entire temporal fossa was filled by dead cellular tissue, and to give exit to the latter and to present an extensive skin slough, I prolonged the lancet incision upwards with a bistoury 1½ inches.

When I had removed the slough, which was very large, and proceeded to deal with the temporal artery, which was necessarily divided in the incision, and which was bleeding rapidly, I anticipated no difficulty in applying a ligature in the ordinary manner, but when I came to do so, I found, owing to the infiltrated state of the skin and cellular tissue, that to seize the mouth of the bleeding vessel was impossible. I then tried to compress the principal artery where it crosses the zygoma, but owing to the extreme state of œdematous swelling I was again unsuccessful.

It then struck me,—while thinking of the ultimate means,—how some Surgeons control bleeding from the coronary arteries during operations on the lower lip by Dieffenbach's forceps, and acting on the thought, although I had not one of those instruments by me, I passed one blade of an ordinary dressing forceps into the wound beneath the upper flap, and the other outside the integument, and between them compressed the divided vessel. I then included the latter, with its integumentary coverings in a ligature passed with an ordinary Surgeon's needle, after the manner shown in the accompanying woodcut, which was kindly drawn for me by Staff Assistant Surgeon H. Gillespie, M.D.

The ligature came away on the fifth day, and the patient made a slow, but good, recovery.



Remarks.—This case, in my opinion, has one or more points of practical interest. It shows how difficult the ligature of a vessel becomes when there is great infiltration of the tissues covering it, and it raises the question—is it correct surgery to make the recognized long incision in erysipelas of the head when, to carry out the practice, it may be necessary to divide an artery?

In concluding this paper, I would beg to bring to notice the very simple measure by which an alarming hæmorrhage was controlled. In doing so I do not mean to say that it should be generally practised, and I am quite aware that an acupressure needle would have been equally as effectual, but where, from extreme hurry, want of assistance, or other surgical circumstance, to apply a ligature in the usual manner is impossible, and where acupressure needles are not at hand, I would beg to bring to notice how almost any artificial hæmorrhage can be promptly dealt with by means of a pair of dressing forceps.

APPENDIX No. XIX.

NOTES ON THE DIAGNOSIS OF HEPATIC ABSCESS.

By A. LEITH ADAMS, Surgeon-Major, 1st Battalion 22nd Regiment.

THERE is in general not much difficulty in discriminating cases of abscess of the liver, but now and then examples occur so devoid of ordinary symptoms as to render the diagnosis extremely obscure even in the hands of persons of great discernment and experience. With the view of comparing the symptomalogies of cases of this description, I recorded in India and elsewhere particulars of many such examples in connection with dysentery, hepatic, and other diseases wherewith abscess is frequently associated and masked, and with which it is liable to be confounded. The selection of cases where every care had been bestowed on the diagnosis cannot be otherwise than interesting and instructive, and whilst instances no doubt occur where more searching investigations might have elicited more accurate deductions; nevertheless, collated as the following have been from various sources with considerable consideration towards their eventualities (at least as far as circumspection enabled me), I have no hesitation in recording them as examples of errors of judgment which all inquirers after truth are more or less liable to incur under what it must be conceded are difficult and embarrassing circumstances such as surround the Physician when studying the complicated phenomena in connection with the diseases of tropical climates.

The connection between dysentery and hepatic abscess is well known, and although the latter is generally associated or preceded by the former, there are very many exceptions to this rule; indeed abundance of instances can be furnished where the bowel affection was secondary, and not a few where abscess of the liver takes place without any affection of the bowels whatever. Among the records of 935 cases of dysentery (acute and chronic), of which 132 proved fatal, I find no less than 15 of the latter were accompanied by extreme suppurative disease of the liver not suspected during life. A much smaller percentage obtained in the cases of acute and chronic hepatitis, of which I have memoranda, *i.e.*, of 843 cases of acute hepatitis and chronic conditions referable to the liver there were 37 fatal cases, 35 of which were from abscess of the liver; nearly all of the latter were at least surmised to be present before death, and the great majority were clearly demonstrated by unequivocal data.

Nearly all the cases I have recorded of dysentery accompanied by abscess were very chronic in their progress, and frequently connected with prior debauchery and intemperate habits, or else in bad constitutions broken down by tropical disease and climate. Married soldiers furnished a large percentage of the fatal cases from hepatic abscess which possibly in not a few existed before the patients' admissions into hospital; moreover it was observed that very few cases of acute hepatitis occurred that were not preceded or accompanied by fever or bowel complaint.

Along the seaboard of Hindoostan, and within the limits of the monsoons, hepatic abscess seems to be most common in autumn and the preceding cold months, and during cool and rainy weather rapidly succeeded by great heat and dryness of the atmosphere. The latter condition is very pronounced on

the west coast of India, viz., high diurnal temperature succeded by chilly nights, when hepatic abscess is very prevalent. I don't know if it is the experience of others, but from personal observation, and the memoranda I possess, it comes out clearly that nearly all the cases of simple abscess of the liver, and fully one-half of the casualties from dysentery among soldiers were associated with intemperate habits.

The only objective symptoms one can reliably associate with acute hepatitis is the pulse and pyrexia. Enlargement of the organ, although necessarily present, is often persistent in Europeans who have resided in India for a length of time; moreover, in plethoric individuals suffering from hepatic symptoms, I have spent much time in vain attempts to satisfy myself on this head.

Mr. Twining insists on the Physician always making up his mind, but I presume there are many of long Indian experience who fail to persuade themselves that they can find enlargement of the liver in cases of suspected morbid conditions of the organ. Tenderness on pressure, the patient's sensations, a dragging pain on change of position, with the history of the case, suffice in most cases of idiopathic liver congestion. Again, pain in the hepatic region, enlargement of the organ, pain increased on pressure, and change of position and respiration; sometimes the pain is dull, at others a sensation of "tearing," is frequently present with pyrexia. The bowels are usually constipated and light-coloured; tenseness of the rectus muscle, and dry tickling cough in combination with the above, are indisputable signs of acute inflammation of the organ.

Distinctions between inflammation of the convex and concave surfaces of the liver have been laid down by authorities, but in practice these are not seemingly always apparent. Vomiting, so frequently cited as indicating disease of the gastric surface, is often a prominent symptom in general congestion of the organ, as I have frequently confirmed by examination after death.

Jaundice has been stated to be a symptom of abscess of the liver, but is most assuredly not a usual or prominent accompaniment of the disease. A dusky hue of countenance and of the sclorotic are frequent sometimes, but a remarkable clearness of the latter is frequently associated with extensive suppurative disease of the liver. Spasmodic rigidity of the rectus accompanies all cases of acute inflammation of the organ, but this obtains whenever tenderness on pressure is present, and appears to be voluntary on the part of the patient, as is observed in nervous diseases of females. The pain or uneasiness in the shoulder is by no means constant in any form of liver disease, but it is not unfrequent as a symptom of chronic functional derangements of the organ.

1. *Abscess of the Liver forming; its early signs mistaken for Ague.*

A soldier much broken down in health from diarrhœa and chronic dysentery was suddenly seized with rigors during a tour of duty in the ranks, followed by profuse diarrhœa. The rigors were considered to be "an attack of intermittent fever, *not* followed by the sweating stage," or, as is vulgarly designated in India, "dead ague."

Five days after the seizure he was suddenly attacked by acute pain in the hepatic region, accompanied by a constant dry cough and ardent fever, which lasted 24 hours. He then expectorated a large quantity of purulent matter, and died five days afterwards, when an immense hepatic abscess was found to have burst into the right lung, and the usual amount of extensive ulceration of the large intestines.

The rigors in this case were most assuredly connected with the liver abscess; probably the above source of error is not uncommon, especially where the previous history is unknown; it suggests careful discrimination in all cases of sudden rigors, more especially seeing that intermittent fever often complicates the diagnosis of hepatic abscess.

2. Here is another case somewhat similar.

Private S., age 28, six years in India, very intemperate in his habits and with a broken-down constitution, was admitted into hospital May 15th "with

"intermittent fever without the hot stage, accompanied by pain in the hepatic "region," but the organ did not seem much enlarged, and his bowels were regular; he suddenly however became much prostrated, and rapidly sank; and died five days after admission. A large abscess filled with unhealthy curd-like pus, occupied the right lobe of the liver; the intestines were greatly distended with air, but no indications of disease of the mucous surface, and the other organs appeared healthy.

3. A very intemperate soldier, 7 years in India, had irregular rigors for several days accompanied by chronic hepatic pains: the former symptoms disappeared, when suddenly he felt his strength *rapidly* giving way. Severe vomiting and dysentery set in for a week previous to death.

The external examination of the liver, and previous medical history, did not elicit any precise information regarding the brewing mischief, the case being considered merely one of complete prostration from intemperate habits, ague and dysentery, coupled with the extreme heat of the weather at the time. The body was very much emaciated; the upper surface of the liver was firmly adherent to the diaphragm, with a large abscess in its posterior part, whilst the colon and the cœcum were studded with large ragged ulcers.

This case, divested as it stands here of other and minute details, might seem to reflect on the acumen of the Physician; but the manner intermittent fevers, dysentery, and hepatitis often combine, and the rapid disappearance of one or other and aggravations frequently mislead the observer; at all events reduce the diagnosis to doubts and uncertainties.

Pleuro-Pneumonia accompanied by Hepatic Abscess.

Private P., æt. 30, small stature, dark complexion, habits very intemperate, served in the Crimea, but only one year in Malta; enjoyed good health and continued at arduous duty until admission into hospital at Malta on the 16th September, when he complained of *general and rapid loss of strength*. He said about 12 days previously he suffered from cold sweats and shiverings and had felt a pain in his belly, but that the latter symptom was of no importance compared with the *extreme and rapid faintness* and weakly feeling which had suddenly come over him.

The face was very pale; eye preternaturally clear; pulse 90; bowels regular; dulness very pronounced from the right nipple to base, with friction sounds posteriorly, and considerable roughness of the respiratory murmur over the posterior portion of the left lower lobe. No respiratory murmur audible in front from the nipple downwards on the right side, whilst the stethoscopic sounds were puerile from apex to nipple, both before and posteriorly. Postural positions did not alter the physical signs on the affected side. No cough or expectoration whatever; he became weaker daily. On the 6th day after admission, he was suddenly seized with a sharp cutting pain extending from the right nipple towards the shoulder-blade. The hepatic region was rather fuller than natural, but there was no pain on pressure or on change of posture; the liver could be felt below the ribs for a distance of about two finger breadths. No shoulder or other hepatic symptoms whatever, and bowels still regular. The *extreme prostration of strength which no stimulating or nutritious food or drink could alleviate* seemed significant. The pulse was exceedingly small, scarcely perceptible at the wrist, and ranging from 95 to 100. On the forenoon of this day he was raised up in order to place a bed pan under him, when he suddenly fainted and expired within an hour.

The examination of the body showed a fair muscular condition with the same physical appearances on percussion over the right side and for upwards of 2 inches below the cartilages of the true ribs. The right pleural cavity contained several pints of straw-coloured fluid; the lung was completely shrunken and bound to the walls and to the diaphragm by recent bands; its substance carnified, but the large tubes patent. Left lung congested on the posterior part of its lower lobe, but otherwise healthy.

Liver enlarged and pushing the diaphragm upwards; left lobe extended into the left hypochondriac cavity; upper surface adherent to the diaphragm,

which was attenuated and on the point of giving way from an abscess which involved the whole upper portion of the right lobe, and contained disintegrated portions of its substance along with pus of a gelatinous consistence.

Another, but a cysted abscess, of the size of a hen's egg, containing pure pus only, together with several smaller ones down to the size of a pea, studded the remaining portion of the right lobe. The left lobe, although enlarged, was seemingly healthy. The upper and largest abscess had evidently burst into a second sac formed by the diaphragm and adhesions, and was on the point of perforating the former. The gall-bladder was larger than usual and filled with thick amber-coloured bile. This man continued at his duty to within 8 days of his death. The case is interesting from the absence of objective symptoms; but inquiry made after death showed that he had been ailing for 3 months, and being a married soldier with a family was therefore unwilling to report himself at the hospital in case of being taken under treatment, and as a matter of course subjected to hospital stoppages; hence the most contradictory and false statements are frequently made by married soldiers with reference to the histories of their illnesses, indeed the most obscure cases of disease in military practice are usually to be met with among them.

Psoas Abscess mistaken for Hepatic Abscess.

Of all the errors one is liable to fall into in the diagnosis of insidious abscess of the liver, perhaps none is less common than confounding it with lumbar or psoas abscess.

Private R., æt. 31, several years in India. When under treatment for chronic hepatitis accompanied by decided enlargement of the organ, there appeared a swelling in the lumbar region under the ribs, and which began to point rapidly, when a trocar was passed into the swelling and nearly a pint of offensive-smelling pus came away. The wound healed up, and he enjoyed tolerable good health for a year afterwards, when a sudden recurrence of the swelling in the same situation obliged him to come to hospital, where, three days afterwards, the cicatrix of the old abscess gave way, followed by a profuse discharge of fœtid bloody pus, which continued for some weeks, when he gradually sank. The whole extent of the psoas was found transformed into a putrid-looking mass, with caries of the body of the two lumbar vertebra. The liver, although larger than usual, did not present an unhealthy appearance, and the intestinal tract showed no morbid conditions whatever.

Disease of the Heart mistaken for Hepatic Abscess about to burst into the Chest.

1. Private R., æt. 33 years, 7 years in India; during that period he was subject to *dyspnœa and pains in the hepatic region*, for which he had been frequently under treatment. When admitted into hospital in India, June 16th, he complained of *acute pain in the epigastrium, in which situation there was evident signs of acute hepatitis, marked by great tenderness on pressure and posture, nausea and constant vomiting, with a very rapid small pulse.* The tumefaction and symptoms generally indicated abscess of the liver on the point of bursting into the chest. The dyspnœa increased daily. He complained of *no cardiac* or *bowel symptoms* whatever. He gradually sank, and died on the 9th day after admission. Hypertrophy of the heart, accompanied by atheromatous disease of the aorta and thickening of the mitral valves, with a rather large and engorged liver, were the only morbid appearances found after death.

Cardiac symptoms, chiefly increased action, palpitation, and dyspnœa, without other physical signs, frequently complicate chronic hepatic disease, and the dyspepsia which invariably accompanies it.

2. I have notes of similar cases. An old soldier who had suffered for many years from *chronic pains and uneasiness in the liver and stomach, with dyspeptic symptoms and palpitation of the heart, or rather irregular action of the latter, jaundiced sickly aspect, and passed pultaceous or loose stools, with general irregularity of the bowels. The liver was enlarged, and at times tender on pressure—the*

latter symptom was invariably relieved by a few leeches. On one occasion he was attacked by intermittent fever, when the liver symptoms became much aggravated, and jaundice setting in he rapidly sank, and died in a few days after admission. The *heart* was much enlarged and hypertrophied, valves healthy; *liver* much enlarged and congested, and of an ochre colour; *gall-bladder* filled with very dark-coloured bile; *spleen* four times its natural size, shrivelled on its surface, and pulpy in consistence, breaking up rapidly.

In the discrimination of the symptoms in these two cases it would appear that whilst admitting the subjective symptoms as regard the cardiac mischief were masked more or less by the objective symptoms referable to the chylopoietic system, it seems no less evident that the former was completely overlooked, and therefore pregnant with interest to the Physician who might meet with analogous cases.

Abscess of the Lung mistaken for Abscess of the Liver.

Corporal D., æt. 38, served 15 years in India, from which he was invalided for chronic hepatic symptoms, and his general health being much deranged he continued constantly ineffective afterwards.

In October 1858, two years after arrival from India, he was admitted into hospital for hepatic pains, when the organ appeared very much enlarged, and was evidently pushing the diaphragm upwards. He had a slight cough, but no expectoration. Shortly after admission he was suddenly seized with a pain in his right side, and expectorated a large quantity of pus streaked with blood, and very offensive. As the symptoms continued for some time, the case appeared to be one of hepatic abscess which had burst into the lung. Gradually the expectoration declined and he gained strength, and finally returned to duty, expectorating occasionally small quantities of pus until July 1859, when suddenly all the above symptoms became aggravated, and the liver showed a larger subcostal sphere of dulness, whilst the right lung gave evident signs of breaking up, as there was an entire deficiency of respiratory murmur throughout. His strength now rapidly declined, and he died, extremely emaciated, on the 19th of September. The right lung was found compressed and firmly adherent throughout, its upper part infiltrated with pus, but slightly crepitant. A large abscess occupied the lower and middle lobes, and was filled with pus, the lower boundary in intimate connection with the diaphragm and convex surface of the liver; the former being very thin and almost reduced to the thickness of tissue paper.

The liver weighed 8¼ lbs., and was of a nutmeg appearance, and of the consistence of a pear, tearing readily with the finger; there was no abscess or any trace of former inflammatory action in the organ.

Hepatic Abscess which burst into the Lungs, afterwards mistaken for an advanced stage of Phthisis.

Private C., æt. 25, invalided from India for fever. On the passage home had several attacks of ague and acute dysentery; as the latter began to disappear he was attacked by cough and a purulent expectoration, with night sweats, which continued until his arrival at Fort Pitt at the latter end of September 1848.

On the day of his admission the sputa, for the first time, was deeply tinged with florid blood; there was great emaciation and hectic; pulse 100; bowels free, occasional diarrhœa; much dyspnœa.

The physical examination indicated an advanced stage of phthisis, with the enlarged liver usually observed in cases occurring in India. The blood vanished from the sputa in a few days, but the right lung seemed completely disorganized from top to bottom, the left to all appearances healthy. About 6 days before death all blood had disappeared from the sputa, which assumed a yellow tenacious phthisical appearance. His strength however *rapidly* gave way, and he died, extremely emaciated, on the 13th of October. The left lung was found quite healthy; the upper lobe of the right was also slightly crepitant, but the middle and lower lobes were infiltrated and broken up by purulent deposits, the lower lobe being attached to the diaphragm, through

which an enormous abscess of the liver had burst into the lung, which now contained upwards of 3 pints of pus. The other lobe of the liver was healthy. In the pelvis of the right kidney lay a calculus as large as a pigeon's egg. It is worthy of note that the urine was healthy and gave no indications of the calculus, nor did he refer to symptoms in connection with the renal condition.

The expectoration of this man was in no way, as regards quantity, more than is usually observed in cases of progressing phthisis, which the aspect of the patient tended certainly to confirm; however, the remarkable isolation of the disease to the middle and lower portions of one lung was, I must confess, suspicious.

It has been stated that the reddish brown profuse matter expectorated in quantities and at intervals should be diagnostic of hepatic abscess, and no doubt, with other symptoms, there need not be much difficulty in coming to a right conclusion in such cases; but after a time, when the expectoration changes to pure pus (as it may do), and there is no previous history, then we have assuredly presented sources of error of which the above case is a good illustration.

Many invalids sent home for other diseases become the subjects of hepatic abscess on the voyage; such cases getting complicated by the time they arrive at the Invaliding Depôt must often render the diagnosis perplexing.

Cases of Abscess of the Liver not suspected during Life.

A young soldier, only a few months in India, had, during the rainy months, an attack of simple continued fever, from which he recovered, but after a few days at duty he felt his strength *rapidly giving way* and came to hospital. He complained of no pain, and stated he had not suffered from any uneasiness in the liver, which however was much enlarged and extended full three finger-breadths below the ribs. He fainted on the 12th day after admission, and never rallied, dying in the afternoon. An enormous abscess occupied the right and another the left lobe of the liver, leaving only about ¼ inch of normal structure around them. The intestines were healthy, and no bowel complaint marked the course of the disease.

The hepatic abscess of the rainy months has been frequently noticed, especially by persons who have studied the disease on the western coast of India. The absence, however, of bowel affection is unusual, and the general negative symptoms in connection with two such enormous abscesses is another important feature in the above case.

2. An old soldier, many years in India, and subject to chronic dysentery, was admitted into hospital suddenly for the latter disease, without any hepatic symptoms further than much enlargement of the organ. The heart sounds indicated a bruit with the systole, and he had suffered from dyspnœa for several months before admission. The dyspnœa suddenly became aggravated on the 25th day after admission, and he expired in the course of a few hours. An hepatic abscess was found to have burst through the diaphragm, and filled the right cavity of the chest with pus. The heart was somewhat hypertrophied and displaced from the pressure in the opposite region. Two quarts of pus were removed from the right plural cavity, the lung of which was much compressed, so as to suspend its function in a great measure. There were several large ulcers in the cœcum and colon.

Very few cases of abscess of the liver run their course unaccompanied by symptoms of intestinal disorder of some kind. Again, we find the diarrhœa which affects old residents often ends in abscess. The diagnosis, however, is clear between the hectic fever, diarrhœa and wasting consequent on abscess; but it is not so apparent when the chronic purging is painless and there are no symptoms of abscess beyond *rapid emaciation and loss of strength*, the latter hastened perhaps by climate. Nevertheless, I was always given to think that when a case of chronic dysentery without any marked symptoms of hepatic disease ends in *rapid emaciation, night sweats*, and *extreme prostration*, the presence of abscess of the liver was to be dreaded.

3. Private L., æt. 31, 8 years in India, healthy until an attack of dysentery, which recurred for several years at various times. On one occasion, when under treatment for diarrhœa of some weeks' standing, he complained of

abdominal pains in the situation of the large intestines, especially the cœcum, where ulceration was surmised to be present. His pulse was never under 100, and aspect hectic, with no tenderness over the liver, which was only perceptible under the ribs for about an inch. He *rapidly* lost strength, *getting constantly faint*, stimulants having no effect in rallying him. He sank and died in the course of a month after admission in a state of extreme exhaustion and emaciation. There was an abscess of large size in the left lobe of the liver; the right appeared normal, excepting two cicatrix-like puckerings on its upper surface. The usual extreme ulcerative disease of the colon and cœcum was observed.

4. An old soldier who had served in India for 12 years was subject to attacks of fever and diarrhœa, but had never complained of hepatic symptoms. When admitted, the 8th June, he was suffering from an attack of remittent fever, which recurred for three successive days, and then left him. He complained of slight pain in the hepatic region at the time, but there was no tenderness on pressure, and the liver did not seem to be enlarged to any remarkable extent.

The pain was referred to the lumbar region and below the ribs. Local treatment by leeches seemed to remove the pain in the right side, but the fever now became continued, with dry furred tongue and *rapid prostration of strength*, accompanied by slight relaxation of the bowels. No symptoms indicated any hepatic derangement of importance. Delirium, hiccough, and a low form of fever setting in, he died on the 23rd day after admission. An abscess, containing about ½ pint of curdy pus occupied the lower portion of the right lobe of the liver. No apparent disease throughout the intestinal tract.

5. Another old married soldier long in India, subject to chronic hepatic derangement, and of a pale and sickly aspect, came to hospital on the 5th of October, suffering from intermittent fever, which was then prevalent. The liver was examined and found enlarged, but he complained of no unusual amount of pain or uneasiness about the right side more than he had been constantly in the habit of experiencing for many years. The ague continued daily for the following fortnight, when suddenly he commenced coughing, and expectorated upwards of a pint of pus at one time. His feeble strength *rapidly gave way*, and he sank a few days afterwards, when a large abscess in the right lobe of the liver was found to have burst into the lung, which was adherent to the diaphragm at its base. Intestinal tract apparently healthy.

Pneumonia masking an Hepatic Abscess which burst into the Stomach.

Private S., æt. 25, during a march in India was attacked by symptoms of congestion of the lower lobe of the right lung, from which he was recovering when suddenly he was seized with vomiting, and brought up a large quantity of pus. No hepatic symptoms were observed before, or even up to the date of his death, which occured on the day following the vomiting of the pus. The *post-mortem* showed traces of the lung disease. A large hepatic abscess had pushed its way through the coats of the stomach, the latter being adherent to the former by firm bands.

Habitual Constipation and accumulations of hardened Fœces accompanying Hepatic Abscess.

A dissipated old soldier, 14 years in India, by trade a tailor, suffered from constant constipation with fœcal accumulations which required a variety of measures before any relief could be attained. During treatment, on one occasion after removal of much hardened fœces, a firm tumour was felt in the hepatic region in the situation of the left lobe, but no pain was experienced on pressure or discomfort on position. In the course of a fortnight he sank from *extreme exhaustion*, with hectic fever, night sweats, and most inveterate constipation, which scarcely any remedies would affect.

A large abscess occupied the left lobe of the liver, and was saved from rupture by the peritoneal investment only; it was filled with healthy pus. Another abscess was found in the posterior portion, containing extremely fœtid pus, whilst a third occupied the *lobus quadratus*, and a fourth the centre of the right lobe; the two latter contained healthy pus.

There were no morbid appearances observed in the intestinal canal or stomach.

APPENDIX No. XX.

TRANSFIXION OF THE RIGHT SIDE OF THE CHEST AND RIGHT LUNG BY A LANCE, WITH RECOVERY.

Reported by Deputy Inspector-General T. LONGMORE, C.B., Professor of Military Surgery.

PRIVATE R— F—, 5th Royal Irish Lancers, *æt.* 35 years, invalided from Lucknow on the 9th November, 1869, for aneurism of the aorta, was admitted into the Convalescent Division of the Royal Victoria Hospital on the 26th March, 1870, under the care of Surgeon-Major Dr. Hardie. The aneurism was stated in the invaliding documents to have been first discovered when the Private was in hospital, under treatment for a penetrating wound of the chest; and the following account of this wound was sent with the patient:—

"On April 1st, 1869, Private F— was accidentally transfixed with his own "lance when on duty. The lance entered his chest in front, between the "seventh and eighth ribs, and passing backwards, and a little upwards, came "out through the scapula below the ridge. There was not much hæmorrhage, "and he made an excellent recovery, and he now only complains of pain when "lifting any weight above his head."

No aneurism was detected at Netley, but disease of the aortic valves, well marked by the usual symptoms, existed to such an extent as to completely disable the man for military duty.

Dr. Hardie was kind enough to call my attention to this patient on account of the lance wound; and, on investigation, I found that the injury presented so many features of interest as to make it well worthy of being fully described and placed on record. I was enabled to collect exact particulars of the history of the accident, not only from the patient's own description, assisted by the handling of a lance such as is used by the 5th Lancers, from the Museum of Military Surgery, but also from the accidental presence at Netley of Hospital-Serjeant Short, 5th Lancers, who was on the spot when the lance was extracted from the patient's chest, and who indeed assisted, under the direction of Assistant-Surgeon Dunn,* in effecting its extraction. Examination of the patient's chest at Netley also elicited particulars of interest in respect to the condition of the structures which had been implicated in the original injury.

History of the Accident.—Private F— was about to start on a message from the orderly room of the 5th Lancers on the morning of the 1st April, 1869, when his horse reared as he was in the act of mounting him. He was lifting his lance across the horse's neck to lower it into the bucket when this occurred, and, being himself thrown forward on his seat, the butt of the lance was also projected in front and touched the ground. No sooner had the horse come down than he again reared, and in the confusion of the moment the point of the lance was now brought opposite to the lower part of the right side of the trooper's chest. The horse came down again on his fore feet while the lance was in that position, with its butt end firmly fixed against the ground, and as the horse descended the lance was thrust forcibly into the

* Assistant-Surgeon G. C. Dunn, 5th Royal Irish Lancers, died in India on the 15th September, 1869.

man's chest, and the point of it out through his blade-bone. The studs of the lance-flag came out of their openings in the lance-iron band as the point of the lance passed through the chest, and the flag fell down on the ground.*

The horse next bolted towards the regimental stables, which were distant about 100 yards from the orderly room, and ran about 80 yards before he could be pulled up; the trooper all the time grasping the lance with his right hand to take the weight off his chest, and pulling up the horse with his bridle or left hand. He appears to have been under the impression that the lance had only gone through beneath the skin of his side, until he succeeded in pulling up the horse, when, turning his head round, and seeing the part of the lance protruding beyond his right shoulder, seized with sudden panic, he threw himself off his horse and fell on his left side. The butt of the lance cleared the horse's neck as the man went over; on the butt coming to the ground, however, which it did with force, the weight of the trooper's body, acting on the long weapon by which it was transfixed, broke the butt and part of the shaft off. Private F— did not lose consciousness. He managed to get partly up on his legs, and, assisted by two syces (native grooms) who ran to him, he tried to get the lance out of his body; but the Regimental Serjeant-Major coming up stopped them, and made F— lie quiet till assistance from the hospital, about half a mile off, could be obtained.

Operation of Extraction.—Assistant Surgeon Dunn, with the Apothecary and Hospital Serjeant, came to the spot where Private F— was lying, without delay. They found him with his coat and shirt taken off, and some horses' litter placed under him. The spear-end of the lance was sticking out behind the shoulder, and was bent from the straight line. The length of this protruding portion was a little over 8 inches. The iron butt, together with a piece of the shaft between 3 and 4 feet in length, was broken completely off, and lying on the ground. The portion of the shaft protruding from the lower part of the chest in front was about 2 feet long, and was splintered. The man was quite conscious, and did not appear to have lost any blood from the wound, owing to both openings being firmly plugged by the lance.

Assistant Surgeon Dunn concluded, from the bent condition of the spear end, that the shaft must be split or broken, between it and the part of the lance protruding in front, in fact, within the chest, and that, therefore, the remains of the lance could not be extracted from below, as otherwise, the shaft being broadest at that part, would have seemed most practicable. The first proceeding accordingly was to cut off as much of the shaft as possible near the wound of entrance, so as to lessen the quantity which would have to be drawn up through the chest and lung. This lower portion was sawn off close to the chest.

Attempts were then made to draw out the spear end and part below, through the opening in the scapula, but without success. This confirmed the belief that the weapon was broken below the portion which was visible. The openings in the soft coverings and in the scapula itself were next enlarged, and, on the end being drawn out a little, the broken part came into view. The iron of the spear plate on the flag side of the lance was found to be broken across, just at the upper opening for the insertion of the flag, nearly one foot from the point, together with the adjoining wood. The iron band opposite to this spot was not broken, but was bent at a considerable angle. They had to wait till a proper saw could be got from the Armourer Serjeant for sawing through this iron band, but as soon as this was obtained, and the division effected, the bent spear end was removed. There still remained the part within the chest. The movements resulting from the efforts to get away the end of the lance, it was found, had caused the sawn end at the front of the chest to pass inwards a short distance, and in consequence what remained of the lance in the chest had to be pushed downwards from the scapular

* The lance of the 5th Lancers is 9 feet in length. The shaft is made of ash, and gradually tapers from the butt to the point. Two iron bands proceed from the spear-head down opposite sides of the shaft, one band having two openings for receiving the flag-studs, and being 21 inches in length; the other band being 18 inches long. The heads of the screws by which these bands are fastened to the shaft slightly project. The circumference of the lance at the top opening for the flag is 3 inches. The weight of the whole weapon is 4½ lbs.

wound, until the end again protruded at the wound of entrance. The end was then laid hold of by the fingers, and on being pulled, came away without any difficulty. A good deal of blood was lost during these operative proceedings, but scarcely any after they were completed. The large opening in front of the chest was temporarily closed by sutures and a bandage, and the man carried in a dhooley to hospital, where he remained about two months under treatment.

Examination of the injured side of chest at Netley.—The situations of the wounds of entrance and exit of the lance are indicated by strongly-marked puckered cicatrices. The front cicatrix is crescentic in form, one inch and a quarter across, and situated over the cartilages of the sixth and seventh ribs. The outer edge of the cicatrix commences one inch to the inner, or sternal, side of a vertical line drawn from the right nipple. The distance from the nipple to the level of the cicatrix is five inches. The cicatrix behind, over the right scapula, has a general oval outline, and is tightly bound down to the parts beneath. The upper end of the cicatrix is an inch and three-quarters below the spine of the scapula; the lower, two inches from the point of the inferior angle: while the inner border is one inch and a quarter from the vertebral margin of the scapula. An outgrowth of new bone can be felt beneath the cicatrix in the fossa infra-spinata, and this appears to be surrounding a deep depression, perhaps a fissure-like opening, in the bone.

Judging from the relative positions of these cicatrices, the lance probably entered the chest between the cartilages of the fifth and sixth ribs, leaning on the conjoined cartilages of the sixth and seventh ribs as it entered: passed obliquely upwards and backwards through the middle lobe of the lung, and making its way out between the third and fourth ribs behind, issued through the scapula and integuments at the spot already described.

Scarcely any traces of the injury to which the right lung had been subjected could be found on stethoscopic examination. There was loss of respiratory murmur over a limited space near the wound of entrance, but nothing abnormal could be detected in other parts of the lung.

The general expansion of the right side of the chest on inspiration, was equal to that of the chest on the left side. Some of the movements of the right shoulder were a little restrained, owing to the adhesions about the scapula, but not to such an extent as would have prevented the man's fitness for duty as a Lancer; the aortic disease, and its consequences, were the cause of his being discharged from the Service.

Although attention was first attracted to the diseased condition when the patient was in hospital on account of the injury to his chest, there was no proof that it had not existed before, nor any means of tracing it to be one of the results of the wound, though it was probably aggravated by it, and by its attendant circumstances.

Although aware of instances of penetrating lance wounds of the lung with recovery having been recorded, I do not remember to have met with any record of a perforating lance wound of the chest and lung with recovery, and thinking the fragments of the lance by which the injury in the present instance was effected might serve as a permanent illustration of the case, I applied for them to be deposited in the Museum of Military Surgery at Netley, and steps have been taken to obtain them for this purpose.

APPENDIX No. XXI.

DELHI ULCERS: THEIR PATHOLOGY AND TREATMENT.

By J. FLEMING, M.D., F.R.C.S., Staff Assistant-Surgeon; with a Note by Professor Aitken.

IN the month of March last year attention was drawn to the local nature of the Delhi ulcers, in a short paper which seems to have excited a good deal of interest in the Profession, both in England and in this country, chiefly from the pathological importance of the subject, its importance to the State, and the views expressed regarding this mysterious disease.

Through the kindness of the Principal Medical Officer, I have been permitted to do duty at Delhi, and consequently opportunities have been afforded of making a more complete, though not exhaustive, investigation into the nature of the disease, and of proving and disproving opinions which have, from time to time, been advanced by various observers. In reviewing the numerous causes assigned to the Delhi ulcers, it is a matter of no little confusion in trying to arrive at the truth, to find that Medical Officers whose opinions are entitled to every respect, advocate, from some reason or other, opposite views.

In a book published by Dr. Fraser, of the Rifle Brigade, in 1863–4, it is stated that the cause "has been attributed to malaria, to the bite of a sort of "fly or insect, to the Delhi water, to impure air, and to bad living acting on "impoverished blood." Dr. Fraser is inclined to think that the cause is in the water, and that there are two varieties.

A paper was also written "On the Causes, Nature, and Appropriate "Treatment of the Delhi Boil and Ulcer," as it occurred in Her Majesty's 38th Regiment during the summer and autumn of 1864 at Delhi. The author of that paper believes that the more the soldier drinks of the waters of Delhi, and the oftner he washes in them, the healthier will he become. He states that the "Delhi boil" in the British soldier "is in a great measure a salutary "effort on the part of nature to throw out of the system by means of the skin "that excessive amount of animal matter which has been accumulating in it "during the hot season"; and also to the effect that the Sepoy gets Delhi boils in consequence of using a monotonous farinaceous diet. It is difficult to reconcile these two statements. He adds: "In the case of the 'Delhi boil' "and ulcer, let us endeavour to remove those causes to which it can reasonably "be attributed, and not vainly seek for specific remedies which do not exist "except in the imagination of the ignorant and superstitious." The "Journal of "Cutaneous Medicine and Diseases of the Skin for October 1867" contains a paper on "Delhi boils," by Dr. Sisson, of London. To commence with, his description of the disease is quite inaccurate, and says "the course of the disease "has so much in common with ague that I think we are justified in assigning to "it the same cause, viz., malaria." He also states that a London Surgeon cut one of these tumours from a patient who presented himself at the hospital, and found he had made a mistake as to its nature, and the general opinion of the doctors there was that the man was suffering from syphilis. No mention, however, is made whether the tumour was microscopically examined or not. Many other papers and voluminous reports have been written which I have not had the opportunity of perusing; but I understand they are of the same speculative, and therefore unsatisfactory character as those noticed; nevertheless they are entitled to every consideration as, no doubt, being the result of patient and mature deliberation. It is therefore necessary to proceed in another direction, and to avoid speculation as much as possible, since nothing of a practical value can be derived from it.

Professor Aitken remarks, in his standard work on the "Science and "Practice of Medicine," that "no exclusive doctrine will now stand the test "of well-directed pathological inquiry, the main object of which is to connect "all organic changes (lesions) and functional derangements with their symp-"toms and causes, with the view of applying rational remedies and pro-"phylactics." Accordingly, impressed with the truth of that statement, an attempt has been made to make a histological examination of the Delhi tumours before and after ulceration has been established, and to carry out a few experiments in order to arrive at a more satisfactory conclusion regarding their nature than hitherto.

The name "Delhi boil" conveys a wrong impression, as the disease is a morbid growth, and has no resemblance to a boil; but Aurungzebe, the name by which it is known to the natives, or some other simple name, would indicate a special and distinct disease in the skin, including every stage peculiar to Delhi and many places in India.

The mode of commencement, growth, progress, symptoms, and terminations have, with some omissions, often been described; but the morbid anatomy does not seem to have ever been attempted by any observer to assist in the explanation of the morbid phenomena exhibited. I may as well state at the outset that the disease has been observed and daily watched on my own person and on others, from its actual origin through the successive stages, and therefore a description as perfect as possible of symptoms and morbid anatomy will be given.

Its first appearance, usually in the skin of the most exposed parts of the body and extremities, resembles a mosquito bite, with the skin slightly elevated. On examination, a number of blood vessels are seen radiating to the centre of this little red spot, which gradually enlarges without any pain, throws off its epithelium, becomes smooth and flat on the surface, assumes a shining appearance, and a relative degree of transparency. *The growth slowly increases in size, and often spreads irregularly to a considerable distance from* the centre by little ridges of smooth skin, and it would appear to attack the roots of the hair and sheath first while it is extending. The growth, or any of its prolongations, pits on pressure, and causes a *stinging* sensation, contrasting well with the healthy skin around. It continues increasing its size, becomes itchy, soft, and generally vascular, with a peculiar brownish appearance, and the hairs fall off, leaving the roots and part of the shafts.

The upper part of the tumour, when near maturity, is the softest, and the small vessels with a delicate covering, in consequence of the epithelium having desquamated, burst with the least violence or pressure, and a scab forms, from under which a yellowish serous fluid escapes. Ulceration then commences at the top, while the tumour is extending at the circumference, and this, at all events, would take place without any injury, as it appears that the material of which the growth is chiefly composed arrives at maturity at its upper part, and, having invaded and destroyed all the normal structures of the skin, ulcerates. The period from its commencement to the ulcerative stage varies according to circumstances; two on my arm previously referred to took exactly three months before arriving at the ulcerative stage, and every care was taken of them, and symptoms noted from the beginning.

The little yellowish spherical bodies existing in these tumours before ulceration, and which were supposed to be ova of parasites, are in reality morbid alterations of the hair bulbs and sheaths. When subjected to chemical reagents they are found to consist of an outer covering of epithelial cells like those of the skin, arranged so as to give the impression of a fibrous envelope, but easily separated by a weak solution of liquor potassæ. The interior of some contains a semi-fluid whitish-looking substance, made up of amorphous granular matter; of others, a fine hair, or a portion of one. Rough sketches of a few of these bodies are given, and the hair from one is shown in Plate I Figs. E and I.

Figs. F, G, and H (morbid alterations of the hair bulbs and sheaths) in Plate I, are from Delhi tumours, and those marked K and L in Plate II. are from Lahore tumours.

Figs. M and N in Plate II. show another altered condition of the hair bulb and part of the shaft much enlarged. A very fine hair is seen making its way

through the shaft of M, at *a*. The specimens from which these drawings have been taken are from Lahore tumours.

If one of these tumours before ulceration is cut deeply out of the skin, and a thin vertical section examined with a low power, it will be found to present an appearance like that shown on Plate I, Fig. A. We find that the normal structures of the skin have disappeared, giving place to what appears a peculiar cellular growth. The white fibrous and yellow elastic tissues are common enough, and seem to resist the action of the cells; but there are no traces of sebaceous or suderiferous glands or fat cells. A transverse section presents no greater peculiarities than those noted, except that the fibrous tissue forms a reticulated matrix for masses of cells, inclosing them in groups the same as in an ordinary fibrous tumour. The ends of cut vessels and nerves are also seen.

Fig. B represents the upper part of another vertical section of a Delhi tumour just before ulceration, showing the papillæ of the skin destroyed as the cell growth advanced.

Figs. C and D show the cells of which the tumour is principally composed, treated with acetic acid and magnified. An opportunity presented itself of examining a Mooltan tumour, ulceration of which had commenced. A deep transverse section exhibited the appearances represented in Plate II., Fig. R, and Figs. T and P are part of the same, treated with acetic acid, showing the peculiar cells. It may be noticed that the microscopic appearances of the Delhi and Mooltan tumours are exactly the same, and indeed so are their histories, external characters, symptoms, and terminations. The Lahore tumours are no doubt similar in every respect to those of Delhi, for their external appearances, mode of growth, &c., correspond, and the hairs undergo the same morbid alterations. The cells, whatever their exact nature may be, which form the substance of these tumours, are oval or spherical, of a yellowish-brown colour, the cell-wall easily destroyed by pressure, and they mostly contain two or more nuclei. In others no nuclei can be detected, but merely an indistinct double cell-wall resembling the sporules of a fungus. Acetic acid renders the cell-wall and nuclei clear. Liquor potassæ dissolves it, leaving the nuclei as little globules, some of a reddish colour, which are insoluble in ether. No mycelium or distinct traces of fungi were detected in any section of these tumours, excepting little globules, some of a light red colour, which resisted the action of ordinary reagents, and whose nature is uncertain.

The fungus in Plate II., Fig. S, was found on the edge of a Mooltan ulcer, but it did not enter the cellular substance. I merely mention this to show that had an undoubted mature fungus been present in these tumours which were examined it could hardly have escaped observation.

The brown apparently cellular substance, whatever may have been its previous relations to the existing physical conditions of Delhi and other places in India, may be considered the actual exciting cause of the disease, and by means of which it invades the healthy structures of the skin, producing changes already noted, which ultimately terminate in its own degeneration into pus.

That such is really the case the following experiments will prove:—On the 15th of November last, a portion of a Delhi tumour, before ulceration, was removed for examination from the arm of a gunner belonging to the 2nd Battery 25th Brigade Royal Artillery. With a small portion of the cellular substance, which was soft and very abundant, I inoculated myself in two places on the outer side of the left fore-arm, 2½ inches above the wrist-joint. The punctures healed in a day or two, and the slight blush of redness caused by the operation also disappeared. Nothing particular was noticed in the situation of the punctures until 10 days afterwards, when a little red spot, like a mosquito bite, appeared in the one nearest the wrist joint, and shortly afterwards in the other. On examination with a hand lens, a number of fine blood vessels only could be detected, evidently causing the blush of redness.

The spots became elevated, brownish and more vascular, gradually increasing in size in the surrounding skin, and in a fortnight from the time of inoculation left no reasonable doubt as to their nature. In the diary of the 19th December, 1869, it is stated that "the places of inoculation are now quite red and raised above the surrounding skin, becoming smooth on the top, and spreading slowly.

On the 20th February, 1870, they had arrived at maturity, and showed signs of commencing ulceration, which soon set in at the upper part of each.

Circumstances at this period prevented an examination of their structure, which was not done until the 6th March, when Assistant-Surgeon Fishbcurne, 103rd Regiment, removed part of the tumour nearest the wrist-joint for that purpose. The microscopical characters corresponded in every particular with the Delhi and Mooltan tumours, and the appearances of section and cells are delineated in Plate III., Figs. C, D, and E.

The photograph on Plate IV. gives a general idea of the appearances and extent of the disease on the 22nd of March, and shows the tendency of the two ulcers to destroy the band of healthy skin between them.

At that time the tumours were in a state of ulceration, and the healthy skin becoming daily more and more implicated with cell growth to an alarming extent, it was thought advisable to prevent their further spread by the repeated application of strong liquor potassæ to the margins of the healthy and diseased structures, which application was most effectual.

When the tumour is in a state of ulceration, or better, when a clean section of the top is made, the peculiar cell growth will be easily recognised by the unaided eye as reddish-brown masses, bounded by fibrous tissue, and part can readily be removed with forceps and examined with the microscope. By what means the cells increase I am not prepared to state; nevertheless it is certain they multiply with great rapidity.

The discharges from "Delhi ulcers" in every stage of their existence have been carefully examined microscopically with the assistance of reagents and boiled distilled water to prevent mistakes, yet nothing beyond the ordinary pus cells, some of which contained reddish nuclei, and minute globules, referred to, were found. The bodies F on Plate III. were obtained from chronic ulcers, and are probably the asci of a fungus.

On the 21st of February, two Europeans were inoculated in four places on the arms with pus from a Delhi tumour just beginning to ulcerate at the top, and which had been specially preserved for the purpose. Pustules appeared in a day or two afterwards, but they soon healed up, and at this date there is not the slightest appearance of an incipient Delhi tumour in any case.

Inoculation of pus from Delhi ulcers was also practised on various natives without any greater effect beyond that which might be expected from any ordinary pus, and the resulting little ulcers healed in a few days, no local application being required. This result might be expected when we consider that the peculiar cell growth characteristic of the disease, the degeneration of existing textures in the skin, necessary to keep up the process of ulceration, is wanting. The disease does not therefore seem to be communicable by means of its pus, and if this were not true it would be an unfortunate circumstance, as the affection would spread with rapidity, which is not the case in practice. The inoculation of the yellowish serous-like fluid (containing the specific cells), which discharges itself at the top of the tumour towards its maturity, has propogated the disease in two instances.

It has been said that similar ulcers affect dogs in Delhi, &c., on the upper part of the nose, at the margin of the hair and mucous membrane; but as yet I have been unable to prove or disprove this statement for want of specimens. It would not, however, be surprising should they on examination turn out to be the same disease.

The cells, the principal characteristics of the Delhi tumours, have been placed in growing slides with various cultivating fluids, and arranged in moist chambers, in order to ascertain what would take place, or whether they are capable of higher development; but nothing beyond ordinary fungi was produced that would warrant any definite assumption.

It still remains to be pointed out and proved what are the existing external conditions necessary to produce this cellular growth in the skin, and what are their previous and present relations, so that a prophylactic method of treatment might be recommended. Ulcers of this class are common enough all over India, and it is reasonable to infer that the same conditions for their production exist. It is known, however, that they occur most commonly after the rains, when heat and moisture, so essential to the formation of morbid growths of every sort, favour the development and spread of the disease. They have

been attributed by some of the latest observers to the drinking of the well water, which contains an unusual excess of nitrates and nitrites, and by others to bathing and washing only in the same water. It is agreed, however, by all, that the cause is to be found in the water, simply because it is more rational to expect it to exist in the water than in any other thing. Supposing the primary cause to exist in the well water, which has only been conjectured (some say it cannot be in anything else, but it is easier to say it than to prove it), the two views with reference to its effects on the system are opposed to each other, one indicating a constitutional, the other a local disease. From what has been already proved, it would appear that the disease is purely local, and does not affect the constitution.

To institute comparisons and make a microscopic analysis of the well water correctly, tracing the relations, if any, of low forms of animal or vegetable life, with the peculiar cell substance, which we now, for the first time see is really the active principle of the disease as it presents itself, is a work of no mean magnitude, and would require time, means, and energy beyond what any ordinary individual could bestow.

The treatment which experience has found the best is the same that follows from the pathology, and consequently may be now perfectly relied on, and will, if carried out, prove thoroughly effectual, viz., destroy the cell substance, and you cure the disease. This may be effected in various ways, but a strong caustic solution, potassæ fusa, or nitrate of silver, might be used, and when the growth is destroyed, and not until then, treat the resulting ulcer on ordinary principles. Subsequent experience will no doubt find out that some caustics or applications have more than others a particular affinity for the destruction of this morbid growth, which is very desirable if the application would be attended with a proportionate diminution of pain. Keeping in mind the pathology that it is a morbid growth of peculiar cells, which increase in numbers rapidly and invade the structures of the skin, the treatment of the Delhi ulcers *et hoc genus omne* need present no difficulty. Neither is it necessary that they should cause any amount of inefficiency amongst the troops or produce any degree of terror, since they can so easily be got rid of, and the sooner they are treated after their appearance the less scar will be left, for obvious reasons. There is now a gunner of 1st Battery 24th Brigade Royal Artillery in hospital for dysentery, with a Mooltan tumour on the upper left eyelid. A short time ago it extended from the inner canthus along the margin of the lid almost to the outer canthus, and was rapidly increasing in size to a dangerous extent, keeping the eye partly shut and preventing the action of the eyelid upwards. Repeated applications of the nitrate of silver has prevented the spread and nearly destroyed the growth, so that he can open his eye at present freely.

The treatment of the large ulcer on my arm next the wrist-joint (as seen in the Photograph) began on the 29th of March by the application of strong liquor potassæ and nitrate of silver every day until the whole growth was destroyed, which event happened in a week, and at this date the ulcer has almost perfectly healed. The other ulcer, which has not had any treatment except to prevent its spreading, is still in a state of ulceration, and would continue so for months, if permitted; but it can and will be got rid of just as readily as the former.

It is certainly unpardonable (I hope I may be excused for saying so) for any one knowing even so much of the pathology as now stated, to tamper with this disease in any stage, particularly on the face, by the application of gentle irritants, such as tinct. mur. ferri, tinct. iodin., &c. &c., or the use of reputed poultices, plasters, or any empirical method whatever.

It is surprising, seeing that facilities more or less for the study of this affection have always been and still are presented in many towns in India, as well as in Delhi, but the co-operation of the Profession, so necessary to a complete and satisfactory solution of such important subjects, has, from whatever cause, evidently been wanting. That this and other similar inquiries important to the Profession, and particularly to the Public and State, should have received so little attention may perhaps be owing to the fact that our statesmen hold out little or no encouragement even in a country fertile with most of the ills that flesh is heir to.

Any one who tries will have no difficulty in verifying what I have tried to describe and delineate, though very imperfectly, in this paper, from actual examination of specimens (many of which are preserved), and in comparison with the symptoms and progress of the disease, yet I can honestly say that even for the little that has been done, and the knowledge that has thereby been gained, I have spared neither labour nor expense.

Inferences and speculation have been as far as possible avoided, to give place to more permanent records; but there are many points of a practical nature which will suggest themselves, and can easily be deduced from what is already known. It is hoped that this contribution may be of some actual value, and that it may be the means at all events of placing the pathology and treatment of the Delhi and other ulcers of a similar kind on a more satisfactory basis.

Delhi, April 25, 1870.

NOTE BY PROFESSOR AITKEN.

HAVING already written a commentary on Dr. Fleming's previous observations, and also on those of Dr. Smith, all of which are published in the 10th volume of the Reports of the Department, I have very little now to add with reference to this more detailed Report by Dr. Fleming.

In this Report, however, there are several points of special interest, and which his observations seem to settle :—

1. He appears to have resolved the little yellow spherical bodies he previously described (and supposed to be the ova of parasites) into cell growths, which attack the roots of the hairs, or hair-bulbs and sheaths of the hair, so that these structures are seen variously altered by disease.

2. He shows that the normal structures of the skin disappear, giving rise to a peculiar cellular growth; and that the white fibrous and yellow elastic tissues alone remain unchanged, forming a reticulated matrix inclosing the masses of cells in more or less distinct and separate groups. As this cell growth advances, the papillæ and hair structures of the skin are destroyed.

3. He shows that the cells which form the main substance of the boils are oval or spherical, of a yellowish brown colour, having a cell-wall easily destroyed by pressure. Some of these cells contain nuclei, others do not, and these latter having a double cell-wall resemble the sporules of a fungus; but, as there are no *mycelia* or other elements of a fungus structure seen, except at or on the edge of an open ulcer (Mooltan), such fungi have no necessary connection with the boils.

4. He shows that this brown or yellow cell-growth (the nature of which is not yet made out) is the actual exciting cause of the disease, by means of which it invades the healthy structures of the skin. He has proved this by experiments on his own person, as well as by observation on others.

5. He has also proved by experiment that pus *alone* from Delhi boils will not propagate the disease, and that therefore the brown-yellow cells are of a specific kind.

6. He shows how easy the boils are of cure; but

7. Not knowing how the specific cells arise which compose the boils, the preventive treatment of the Delhi boils is yet undetermined.

PLATE I

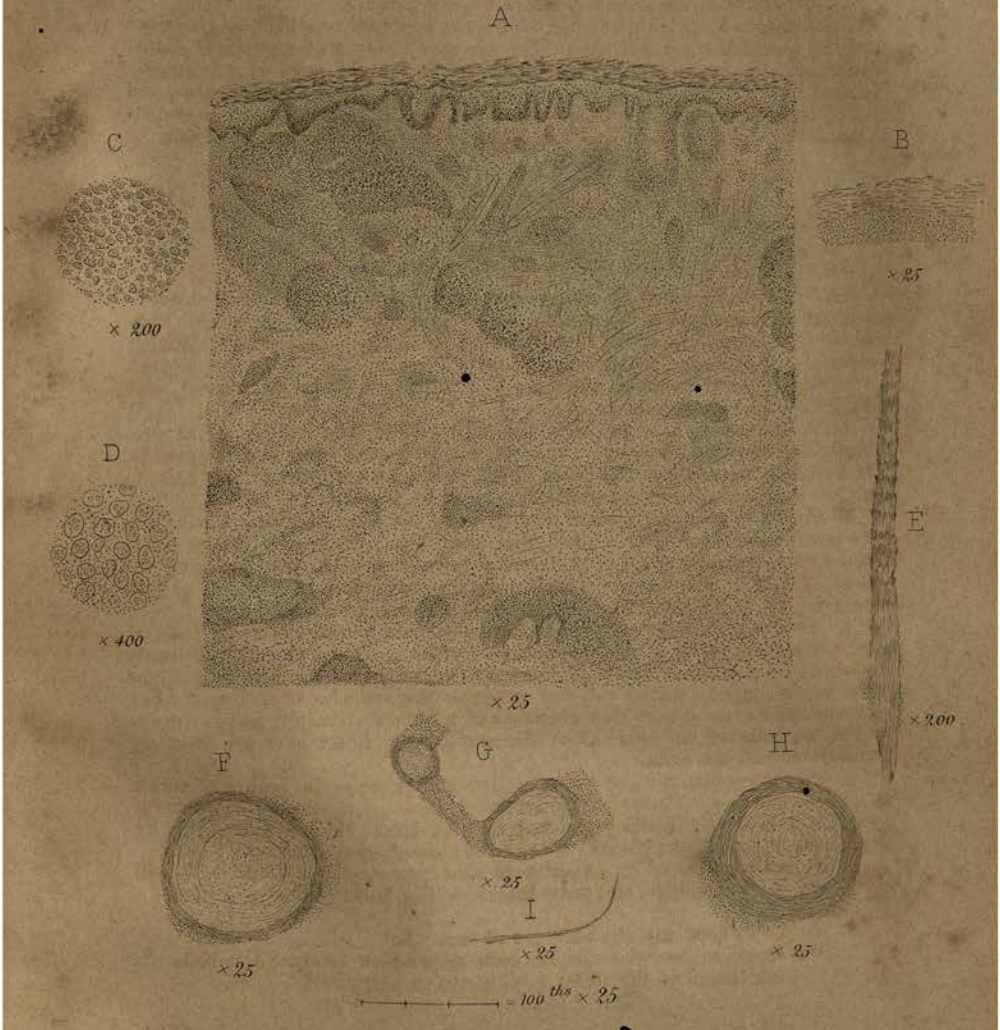


Fig. A.....*Vertical Section of a Dehli Tumour before Ulceration commenced*

B.....*The same in an advanced stage, showing the Papillae destroyed*

C & D....*Section of a Delhi Tumour after the addition of Acetic Acid, showing the peculiar Cell structure*

F G & H...*Cystic formations of the hair bulbs & sheaths*

E & I....*A fine hair from the interior of F a Cystic formation.*

Vincent Brooks Day & Son Lith

PLATE II.

× 25

L

× 25

M

a

× 25

N

× 25

P

× 400

× 400

S

× 200

R

× 25

T

× 300

= 100ths of an In: × 25

Vincent Brooks Day & Son Lith.

PLATE III.

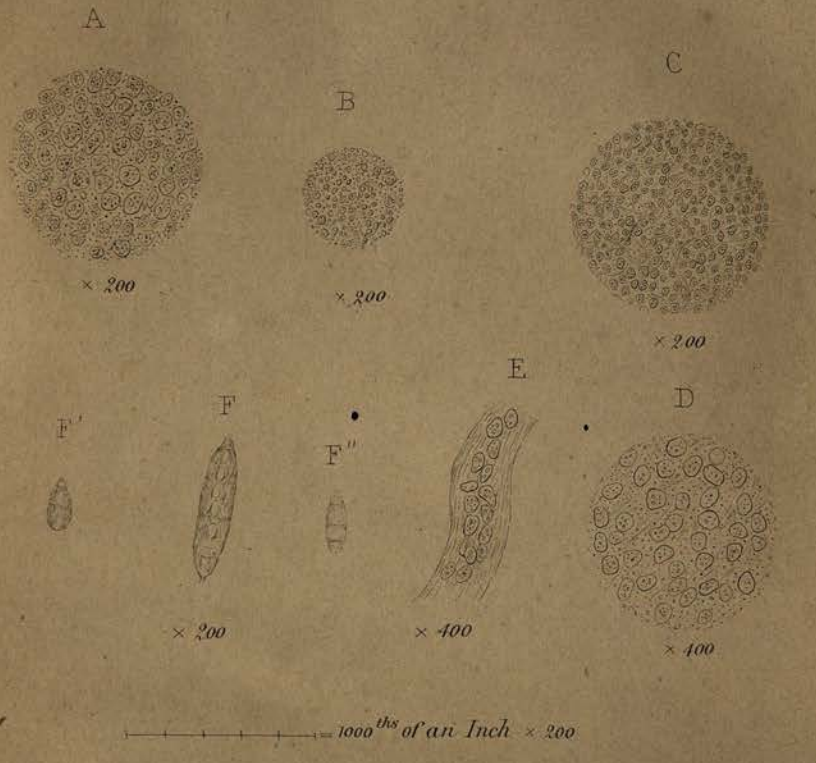


Fig. A ..... *Pus from a "Delhi Ulcer" produced by Inoculation.*

„ B ..... A + *Acetic Acid.*

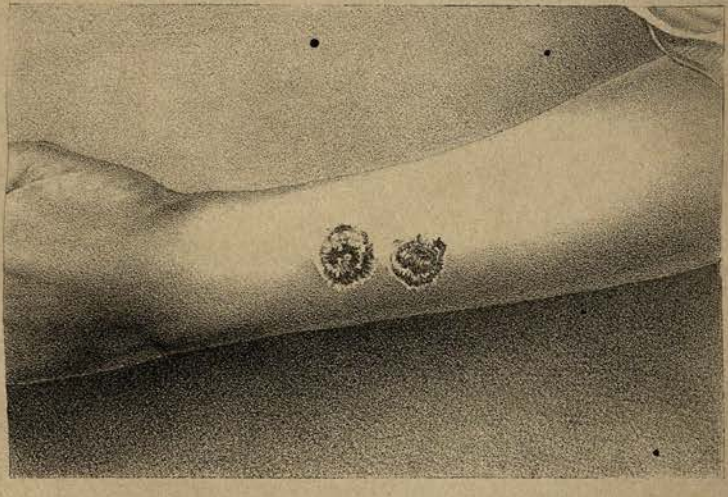
„ C ..... *A Section of the Tumour before Ulceration.*

„ D ..... *Part of* C *highly Magnified.*

„ E ..... *Shows a disposition of the Cells, observed in some Sections. Acetic Acid has been added in each Case. Produced by Inoculation.*

„ F F' F'' *Bodies found in the examination of Pus from Chronic "Delhi Ulcers" magnified 200 diam^r.*

Vincent Brooks Day & Son Lith.



"DELHI ULCERS" produced by inoculation of peculiar brownish cells.—Plate I. Figs. C & D.

2nd March, 1870.

Vincent Brooks, Day & Son, Lith.

APPENDIX No. XXII.

BAVARIAN METHOD OF APPLYING PLASTER OF PARIS SPLINTS TO FRACTURED LIMBS FOR THE PURPOSE OF TRANSPORTING WOUNDED.

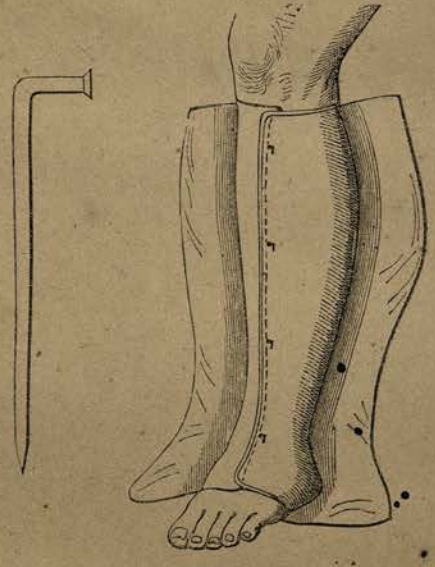
By Staff Assistant-Surgeon A. Moffitt.

Since writing on the subject of plaster of Paris splints I am indebted to Mr. Otto Streidinger, late Secretary of the Army Medical School, for a description of the method now under consideration. It is that in which the men composing the Sanitary Corps of the Bavarian Army are instructed, and therefore it has been called the "Bavarian Method," but whether properly so, or not, I cannot say. However, whoever may be the originator, it seems to possess many advantages over the methods hitherto employed in this country, and is applicable not only for transport purposes, but for the treatment of fractures generally; especially compound fractures, where wounds have to be dressed.

For the application the following apparatus is necessary, viz.: flannel, pins, each three inches long, bent to a right angle three-quarters of an inch from the head, fresh plaster of Paris, water, either cold or hot, a basin and spoon, a needle and thread, and a roller bandage.

A piece of flannel, sufficiently large for the limb to which the splint is to be applied, is doubled and cut of shape and size not only to envelope the limb, but to overlap to the extent of about two inches. The two folds of flannel are then stitched together in a seam along the centre, lengthwise. This done, the limb is laid on the flannel along the seam, and the broken bones being replaced in their natural position, the inner fold of flannel is brought up and its edges pinned together along the upper or front part of the limb, so as to envelope it tightly and evenly. In pinning the edges the pins should be so inserted that their heads will not be covered by the plaster, otherwise there will be difficulty in withdrawing them when the splint is completed.*

The accompanying sketch shows the inner fold of flannel adjusted to the limb, and the outer fold spread out.



* The artist, in the drawing, has mistaken what I intended to represent—shafts and points of pins as stitches, none of which are used. The edges of the inner layer of flannel are also made to appear as if lying flat one upon the other; they should be, though approximated, projecting, as happens when two edges are pinned together, according to the description in the text.

The next step is to mix the plaster of Paris with water, using about equal quantities of each. When the mixture thus formed begins to show signs of setting, it should be turned out of the basin into the angles at each side of the limb, between the two folds of flannel. This done the plaster is spread with the spoon, as evenly as possible, in a layer about half an inch thick, over the inner fold of flannel. The outer fold is then brought up round the limb over the layer of plaster, and its edges being brought together and held tightly in that position, the plaster thus retained between the two folds of flannel should be pressed and smoothed with the hand so as to form a well-fitting case for the limb.

When setting of the plaster has taken place, the pins are withdrawn, the edges of the flannel trimmed off, and a roller bandage, or a few straps with buckles, applied round the whole.

By this method a splint is formed in two parts, hinged to each other by that part of the flannel where the seam is. One side or both can be let down without disturbing the fractured limb, when it is necessary to expose it for dressing a wound or other purpose.

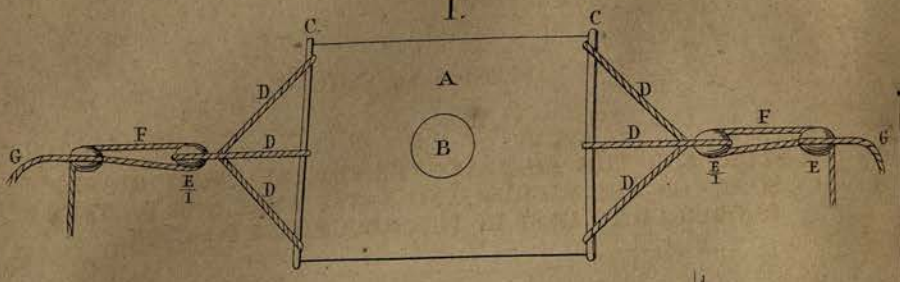
Plaster, when placed between two layers of flannel, as in this method, forms a splint of great strength. It fits the limb so accurately that an even pressure is exercised on the muscles, and thus their action is to a certain extent prevented, consequently a very frequent cause of displacement in transport is obviated.

The question is repeatedly asked: "Is it intended to apply plaster of Paris splints on the field of action; that is, before the wounded are carried to the dressing stations?" The application is, I believe, unsuited for this purpose; it would occupy too much time, besides there would be difficulty in providing the apparatus necessary. It can however be applied in the field hospitals, when it is necessary to transport patients with fractured limbs to the hospitals in rear, and for this purpose it will be found equal to, if not superior to, any splint yet devised.

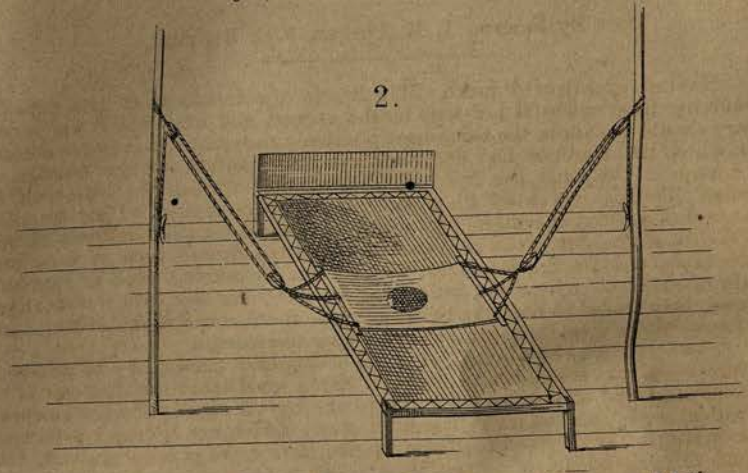
SURGEON PORTERS

Sling for the more convenient treatment of Bed-sores in Camp hospitals

1.

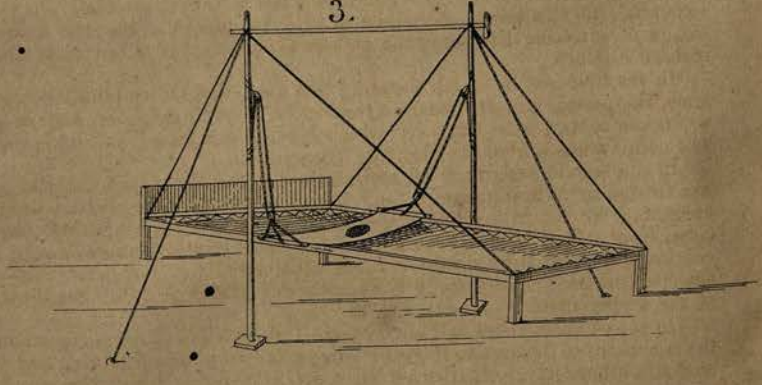


2.



Sling as used in a Hospital Marquee in the case of J.H. of H.M.S. St George

3.



Sling as used in Hospital Ward Vide A.M. Report for 1868 p. 346.

A. *Piece of West of England Canvas 18×24 inches.*
B. *Hole where Canvas 4 inches in diameter has been removed.*
C. *Pieces of Wood on which Canvas has been stitched.*
D. *Stays for attaching sling to blocks.*
E. *Three inch blocks.*
F. *Lines for raising and lowering sling.*
G. *Whip for fastening blocks to poles or uprights.*

Vincent Brooks Day & Son Lith.

APPENDIX No. XXIII.

A SLING FOR THE MORE CONVENIENT TREATMENT OF BED SORES ON THE SACRUM AND NATES WHEN THE PATIENT IS OBLIGED TO REST IN THE RECUMBENT POSITION.

By Surgeon J. H. Porter, 97th Regiment.

Having experienced much difficulty in the treatment of two patients suffering from extensive bed-sores on the sacrum and nates who it was necessary should remain in the recumbent position on account of recent amputation, in which the ligatures had not come away and perfect rest was essential, I constructed the sling, Fig. No. 1 of Illustration, on which the hips could be raised, pressure taken off the sores, and dressings applied. I am aware of there being many ingenious lifts and contrivances for the treatment of bed-ridden patients, but at the time the sling was constructed none of them were available, and the bed-sores with which I had to contend were so extensive, the discharge so copious and fœtid, that air and water beds, which were at first used, only tended to heat the parts, increase the ulceration, and it was almost impossible to dress them without disturbing the stumps.

The sling consists of a strip of West of England canvas, 18 × 24 inches; at either end it is stitched on to pieces of strong wood about the diameter of the common round office-ruler, which keeps the canvas expanded when under the patient, and form means of fastening stays, which are spliced together and attached to 3-inch blocks. These blocks have ropes passing through them and through blocks of same size attached to poles or uprights, by which means the sling can be raised or lowered. A piece of canvas, round in shape, about 4 inches in diameter, is removed from the centre of sling, through which the sores can be dressed or cleaned. In applying the sling it is necessary to place a mattress doubled at one end under the patient's shoulders, the thin end extending to the loins. A pillow should be placed under the knees, and, except for dressing the sores, the patient should not be raised more than one inch off the bed.

In the first case in which the sling was used, that of amputation below the knee, the patient was treated in a three-pole hospital marquee, and advantage was taken of two poles (between which his bed was placed) to attach the sling. The contrivance is given in Fig. 2 of Illustration.

In the second case, that of amputation at the shoulder-joint, the patient was treated in a hospital ward, and it was necessary to construct temporary uprights from which to suspend the sling. This was done with the two poles taken from a Regulation Hospital-stretcher and a crutch for a cross-pole, which was kept in position by means of cords attached to the iron bed. This case is described in the "Army Medical Reports for 1866," p. 346. An illustration of the arrangement is given in Fig. 3.

On active service and in Indian camps I have found much inconvenience in the treatment of bed-sores, it being impossible to obtain lifts, &c., and I have no doubt others have experienced the same, I therefore trust this simple and inexpensive contrivance may be considered worthy of further trial in camp hospitals.

[APPENDIX No. XXIV.

ON THE NECROMETER.

By Staff Assistant-Surgeon T. Oughton.

It will be readily admitted that the onward progress of pathological and physiological inquiries has hitherto encountered a very serious obstacle in the poverty of scientific resources having for their object the taking the specific gravity of vital organs. The old process, based on the well-known theorem of Archimedes, viz., the comparison of the weight of a given body in air with the loss of weight that is sustained by its suspension to the arm of a balance and its subsequent immersion in water, has been found in the experience of the internal viscera to be not only extremely tedious but extremely unpleasant from the awkwardness of the process. Hence, whilst standard works on the subject of physiology do not fail to mention the specific gravity of bile, blood, milk, and urine, as important matters for consideration, they discard the use of the term *in toto* in relation to coagulum, muscle, bone, tendon, and cartilage, &c., as forming no distinct bearing on their special branch of inquiry. In pathology, likewise, the very valuable results that would accrue from a knowledge of density of tissues in relation to their normal and diseased states are in abeyance, being restricted by the absence of a suitable and convenient method of ascertaining it. For instance, how rarely do the most eminent authors on the subject of practical medicine allude to the specific gravity of the viscera as being especially conjoined with and characteristic of a given form of organic lesion.

That an improvement in the old process of taking the density of diseased structures is desirable, and that a want has been much felt in this direction by pathologists, is evident from the frequent employment by them of the gravimeter. A viscus being plunged into water, strong saline solutions, as of magnesium sulphate or aluminium tersulphate, are added until the liquid equals it in density, and a hydrometer records its specific gravity when on the point of floating. Several interesting researches which indicate the connection of certain abnormally high or low densities with particular organic lesions have been recorded by this means; nevertheless, it must be regarded as an inconvenient process, and giving rise to a very ineligible series of experiments, especially in the case of an organ like the liver, which will frequently displace nearly a gallon of water.

The under-mentioned apparatus is an extremely simple contrivance for taking the specific gravity of large and irregular bodies such as the internal viscera, and the method of conducting its operation is equally facile and of a very interesting nature. A quantity of water that is equivalent to the cubic capacity of a given organ is measured by it with little trouble, and the density of the organ is expressed by a very ready comparison of the weight of this volume of water with the weight of the organ itself in air. So that no fewer than three distinct results will be recorded by this instrument, each of much

importance in a pathological sense,—viz., the weight, the cubic capacity, and the specific gravity of the given organ. The weight and cubic dimensions of a standard healthy viscus being known, we shall be enabled to recognize any departure from such standard, and likewise to notify the degree of organic hypertrophy or atrophy that may exist. Moreover, a standard normal density being established, we shall be enabled to explain a high specific weight as due either to congestion, inflammatory or sanguineous effusions, abnormal interstitial deposits, or the calcareous and lardaceous degenerations; and, on the other hand, a decrease of density will be referable to the presence of fatty degeneration, ulceration, the formation of cysts, or the ramollissement of textures from interstitial absorption.

Specific gravity will probably be found to throw some light on the pathological causation of certain diseases which terminate fatally and leave behind no record of any special structural lesion that is sufficient to account satisfactorily for the fatal termination,—*e.g.*, certain forms of tetanus, chorea, and hydrophobia. This statement would seem to be confirmed by the following abstract from the very valuable work by Professor Aitken on the Science and Practice of Medicine, having reference to the after-death condition of the central parts of the brain in a case of chorea which terminated fatally after a most violent attack:—"The specific gravity of the corpora striata and thalami optici was "different on the two sides of the brain; those on the right side were of the "specific gravity of 1·025, those on the left side of 1·031, and this difference "appeared from the hydrostatic experiments as well as from those made with "the gravimeter, confirming in some measure the accuracy of the general "result." The remarkable dissimilarity existing in this case between the two cerebral hemispheres in respect of specific weight appeared to explain the disordered action and absence of co-ordination existing between the nerves and muscles during life.

Strict reasoning, moreover, would seem to lead up *to* the conclusion that specific gravity is an essential *factor* in *all* necroscopical investigations, including diseases with whose pathology we are tolerably intimate, since a change in the constitution of vital texture,—*i.e.*, a metamorphosis of structure, will imply of necessity, an altered density and likewise a probable alteration in the volume of the organ. In other words, every *post-mortem* report will be defective so long as the careful record of the weight, cubic capacity, and specific gravity of the morbid organs is ignored, and especially in connection with the viscera that have been more intimately charged with the fatal termination. Consequently, the utility of a form of registration similar to the annexed Table being attached to special *post-mortem* folios will be apparent:—

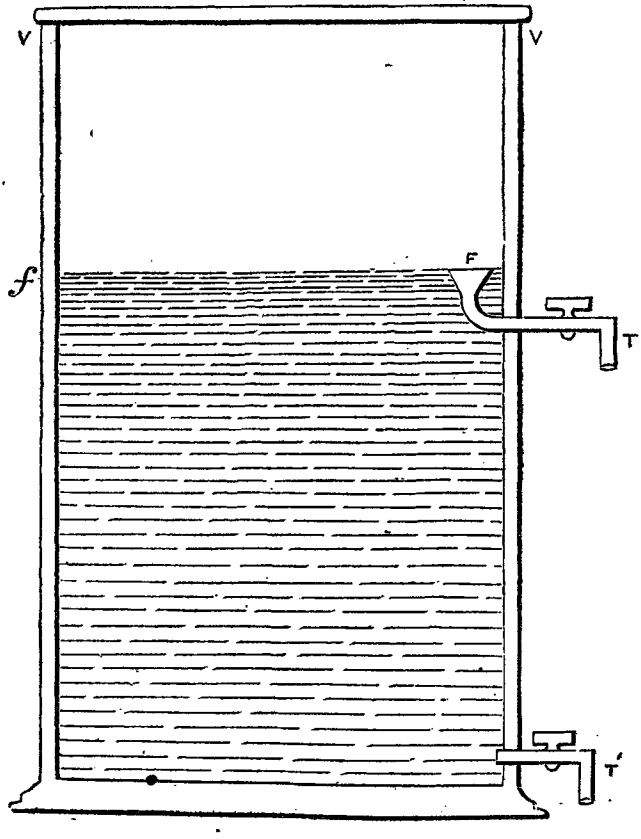
Organs.	Weight in drachms, avoirdupois.	Volume in cubic inches.	Weight of Water displaced in drachms, avoirdupois.	Specific Gravity.
Brain				
Heart..				
Lung, right				
„ left				
Liver				
Spleen				
Kidney, right				
„ left				
Testicle, right				
„ left				

We are at present uninformed in what manner the weight, &c., of the morbid viscera are related to their ordinary pathology as well as to the symptoms that have been prominent during life, even in well-known diseases. This will be a subject for experimental inquiry hereafter, and there can be no doubt that much useful information and practical benefit would be derived by

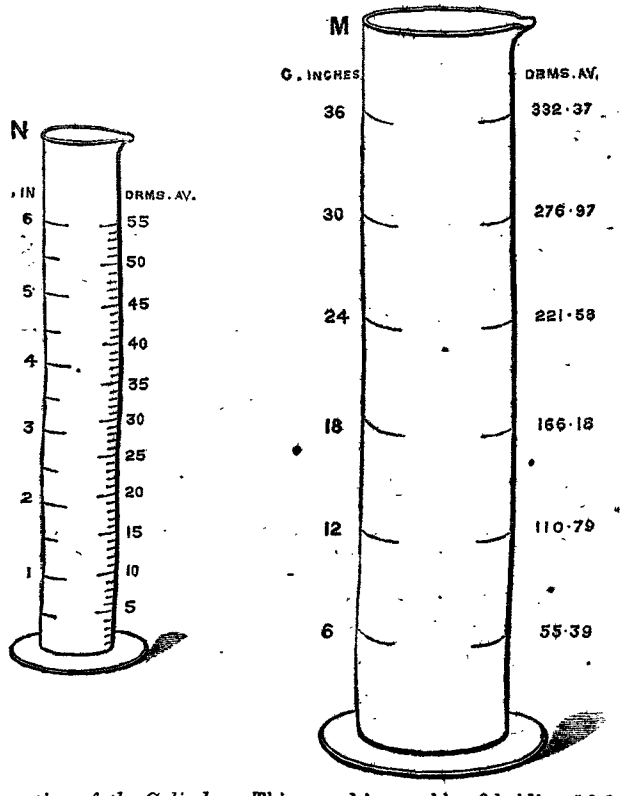
the extension of this branch of scientific research over numerous cases of diseased organs. Moreover, these experiments would be extremely useful by engendering correct and definite ideas respecting the weight, specific gravity, and actual size of the different viscera in their natural and healthy condition. Such are the reasons that suggest the introduction of the present set of apparatus into the dead-houses of military hospitals as a permanent piece of furniture.

The entire apparatus that is requisite in the above investigations is comprised by an ordinary counter weighing-machine and the necrometer. The weighing-machine should be capable of weighing 6 or 7 lbs., and turning to half a drachm; it will give the weight of the organ in drachms avoirdupois. The necrometer consists of a cylindrical vessel VV (*see* Diagram), made either of metal or porcelain, and two glass measures, M and N, properly graduated.

NECROMETRIC CYLINDER.



NECROMETRIC MEASURES.



Construction of the Cylinder.—This vessel is capable of holding 16·6 gallons of water, and it has a total cubic measurement of 2·14 feet. It has a discharge-pipe, T, communicating with its interior, and this is fitted with a stop-cock. A bent tube passes upwards into the cylinder from the inner aperture of the pipe, and this is surmounted with a funnel, F, having its aperture perfectly horizontal and parallel to the base of the vessel. The following are the dimensions of the various parts:—Diameter of the cylinder, 14 inches; height, 24 inches; height of stop-cock, 14 inches; height of the aperture of the funnel, 16 inches; diameter of the aperture of the funnel, 1·5 inches. The area of the vessel below the aperture of the funnel will be 1·4 cubic feet, and it will contain rather upwards of 11 gallons of water. These dimensions will be amply sufficient to admit the largest livers and spleens, such as some that are preserved in the Museum at Netley. A second tap, T', placed near the bottom of the cylinder, will be very convenient to allow the instrument to be emptied at the termination of the investigations.

Construction of the Measures.—The necrometric measures have a double, metrical scale affixed to them. Each is graduated to measure cubic capacity in inches on one side, and to indicate the equivalent weight of distilled water in drachms (avoirdupois) on the other. The larger measure, M, stands 11·5 inches in height, and its diameter is 2·17 inches; it will measure 36 cubic inches of capacity, and likewise the equivalent weight of water, viz., 332·37 drachms, a cubic inch of distilled water at 62° Fahr. weighing 252·45 grains, or 9·2325 drachms avoirdupois. It is divided into six portions, each of these being equal to 55·4 drachms of water, or 6 cubic inches. The small measure N, stands 8·15 inches in height, and has a diameter of 1 inch. On one side it is graduated into cubic inches and half inches, and on the other into single drachms; it has a capacity of 6 cubic inches.

The method of using the necrometer is as follows:—Close the stop-cock and fill the cylinder with water until it rises above the aperture of the funnel; on allowing the water to escape through the tube, T, it will find the level, *f* F. The organ to be measured having been well washed and weighed in the machine previously, is now introduced into the vessel after re-closing the stop-cock. Lastly, the water that has been displaced is allowed to escape once more through the tap to the level, *f* F, and is received into the glass measures. The bulk or volume of the immersed organ will be at once indicated by the measures, and likewise, the weight of an equal volume of water. Divide the weight of the organ in air by the weight of the water of displacement, and the quotient will express its specific gravity; or, the specific gravity of an organ may be calculated from a knowledge of its weight in drachms in air and its cubic measurement in inches alone, without determining the weight of the water of displacement, in the following manner:—Divide the weight in drachms in air by 10, that is, remove the decimal point one place towards the left; then put the volume in cubic inches in the first place of a rule of proportion, the weight in drachms so divided in the second, and let the third place be represented by 1·083; the fourth ratio will express the required density. For example, in Table I, appended, the volume of the brain is 81·75 cubic inches and its weight in drachms in air is 824. Then,

81·75 : 82·4 :: 1·083 : 1·091 specific gravity of brain.

The rationale of this method of calculation is due to the specific gravity of a body being dependent on a definite relation existing between its intrinsic weight and its intrinsic bulk. When the volume in cubic inches of any given body is exactly equal to its weight in drachms in air its specific gravity will be ·1083; when the volume is exactly 10 times less than the weight, the specific gravity will be 1·083. It will be seen, on consulting the subjoined Tables, that the volume of most of the internal viscera in cubic inches is about 10 times less than their weight in drachms in air; accordingly the number 1·083 is very conveniently employed as the factor of the third place in the rule of proportion for determining their specific gravity.

When an organ is specifically lighter than water, *e.g.*, the lung, the preceding operation will require a slight modification. It will be necessary in this case to make use of a heavy solid whose volume and equivalent weight of water have been determined already. Having tied this to the lung so as to sink it, the volume and the water-weight of the two parts are ascertained according to the plans already described; then deduct the volume and weight respectively of the body added from the total volume and weight of displaced water, and divide the weight of the lung in air by the difference in weight of the two volumes of water for its specific gravity. A second plan consists in dividing the weight in drachms of the water that is displaced by the lung in its floating condition by the weight in drachms of the water displaced by it in a state of complete immersion. This method is dependent on the important hydrostatic law that the volume of water that is displaced by any floating body is precisely equal in weight to the weight of the body itself in air; in other words, a floating body communicates its entire weight to the liquid on which it is resting, and the resulting equilibrium is established by the downward gravitation of the body being evenly counterpoised by the upward hydrostatic pressure of the liquid. In dealing with the lungs also, it will be advisable to make three observations:—1st. Determine the specific gravity of each *en masse*, the result being recorded in the tabular register. 2nd. Of parts of lung which float. 3rd. Of portions of consolidated lung. If this method be not pursued, the condensed and unhealthy tissue counterbalances the light and healthy or slightly congested tissue, the light portions diminishing the heavy relatively, but in a way not otherwise determinable. The two latter observations should be recorded in the detailed *post-mortem* report. It may be required to take the specific gravity of the testicles, and it is probable that the record of their density may add some light to the pathology of constitutional syphilis. In dealing with these small organs, they may be dropped at once into the smaller measure containing a marked quantity of water, when their water-weight will be apparent from the rise in the level of the liquid.

One or two further remarks may be made in reference to the practical working of the above process:—1st. It would be well to collect the displaced

water in some vessel in the first instance, such as an ordinary pint measure, and to transfer it to the necrometric measures subsequently; this plan will prevent any waste in dealing with large organs—the liver for instance, which may require the large measure to be re-filled three or four times in succession. The small measure will record the bulk and weight of any residual water that may be in excess in the large measure beyond or between its points of graduation. 2nd. After removing the water that has been displaced by a given organ, it will stand at the proper level, and the apparatus will be in the proper condition for the immersion of a second organ; that is, it will not be necessary to remove the organ and re-fill the cylinder after each experiment, so that considerable time will be economized in this manner. 3rd. The water in the cylinder may be rendered impure and of high specific gravity very speedily by serous, purulent, or sanguineous contamination from the immersed organ. This will be found, however, to have no practical influence on the accuracy of the process, inasmuch as the ultimate correctness, in terms of distilled water, of the cubic dimensions and weight of the displaced water is dependent upon the proper graduation of the measures that are employed rather than upon the density of the water itself.

Any properly-graduated measure may be employed to collect the displaced water in the absence of the necrometric measures, although the calculation will be rendered rather more complicated by their use. The following Tables, in this case, will supply the requisite information :—

Cubic capacity.		Weight of Water.
0j = 27·7	cubic inches. ..	256 drachms, avoirdupois.
℥j = 1·73	„ „ ..	16 „ „
ʒj = ·1083	„ „ ..	2 „ „

Or, on the metrical system :—

Cubic capacity.		Weight of Water.
A litre	= 61·03 cubic inches. ..	563·45 drachms.
A decilitre	= 6·103 „ „ ..	56·345 „
A centilitre	= ·6103 „ „ ..	5·6345 „

It will be seen on referring to the first of these Tables that a pint and fluid ounce of distilled water, according to the Apothecaries' measure, is equivalent in weight to the pound and ounce of avoirdupois respectively, whilst the fluid drachm weighs *two* drachms avoirdupois. Consequently, after having ascertained the number of Apothecaries' drachms that an organ has displaced, it will be necessary to double them previous to dividing its weight in drachms in air. It would be a better plan, perhaps, when only a litre or a pint measure is at hand, to graduate them into cubic inches, and then determine the specific gravity from the weight in air and the cubic measurement of an organ simply, according to the method already indicated. Then the weight in drachms of the water of displacement could be determined subsequently, if desirable, by dividing the weight in air by the specific gravity. In case only Apothecaries' weights are at hand to weigh the organ, it will be necessary to bring them into grains and to divide by 27·34 in order to obtain its weight in drachms avoirdupois.

In July last I forwarded to the Director-General a description of the necrometer, with an explanation of the mode of its operation, and he was pleased to express a favourable opinion respecting it. One of these instruments was introduced into the dead-house of the Army Medical School at Netley, and was in use during the *post-mortem* inspections of the recent winter session. It gave very satisfactory results in the case of the larger organs, viz., the brain, lungs, and liver, but the weighing-machine was not sufficiently delicate, and the necrometer of the above dimensions did not furnish a sufficiently reliable result in the case of the smaller viscera, as the heart, spleen, and kidneys. A small necrometer, therefore, was made use of for these organs, and a weighing-machine that was capable of weighing upwards of a pound and turning sharply to half a drachm. The Tables that are appended furnish the records of the necrometer in the *post-mortem* examinations of a portion of the session, and the following memoranda were made in connection with each case :—

Table I. Autopsy. 10th October, 1870.—This Table has reference to a case of abscess of the liver occurring after two distinct attacks of hepatitis.

The patient had contracted both the intermittent and remittent forms of paroxysmal fever in India, and he was taken ill with dysentery previous to his first attack of hepatitis. On the 17th June ultimo, the abscess was tapped, and between this and the 2nd October (during which the operation was performed 20 times with the pneumatic aspirator of Dieulafoy) 688 ozs. of purulent fluid were drawn off; 66 ozs. were evacuated on one occasion. A large opening at the middle portion of the anterior aspect of the right lobe of the liver was found to communicate with the cavity of an abscess which occupied nearly the entire lobe. Notwithstanding the excessive suppurative action that had been present and the extensive excavation in the right lobe, a very abnormal enlargement of this organ may be remarked; it displaced 164·3 cubic inches of water.

Table II.—A case of urinary fistula resulting from the opening of a perineal abscess that had supervened on an attack of gonorrhœa, complicated with stricture of the urethra. The patient had been passing large quantities of pus daily in his urine, and had lately become extremely feeble and emaciated. There was found complete disorganization of the right kidney, the cortical portion being broken up by numerous alveolar abscesses which communicated with each other, and its specific gravity was high. The right testicle was of very firm texture, and was found on section to contain a dense white core (probably syphilitic), whilst the left testicle was soft and flabby; the difference in the specific gravity of these organs was very noticeable.

Table III.—This patient had been an inmate of the lunatic asylum, but he succumbed eventually to an attack of peritonitis. The *post-mortem* examination revealed the following conditions in the head:—Considerable thinning of the parietal bones, corresponding to the site of the Pacchionian glands of the dura mater, and an irregular thinning of the entire calvarium. A film of clear adhesions, similar to the substance of hœmatoma, caused the dura mater to be firmly adherent to the brain at the vertex and along the edges of the superior longitudinal sinus. Arachnoid opaque, especially over the superior convolutions. Flattening of the convolutions more marked on the left side than the right. Softening of the brain substance of the central ganglia, especially posteriorly on exposure of the lateral ventricles; central parts of the brain around the commissure generally soft and pulpy. The most interesting points in the accompanying Table are—1st. The low specific gravity of the brain (only 1·027) and its excessive hypertrophy (equal to 87 cubic inches of displaced water) in connection with the marked absorption of the calvarium, the flattening of the cerebral convolutions and other evidences of pressure having been exerted from within. 2nd. The exceeding smallness of all the abdominal viscera, especially the spleen.

Table IV.—There were the following local *post-mortem* appearances:—Strong adhesion in the left pleura, especially towards the apex, and increased vascularity in the parietes of both pleural cavities. General consolidation of both lungs, especially posteriorily and towards the apices, looking as if injected with tallow. Left lung extremely disorganized and softened towards the apex; small cavities were interspersed throughout its substance, varying in size from a pea to a walnut, the larger cavities being lined by a very obvious grey membrane of visible thickness and tolerably consistent. The minute bronchial tubes were loaded with purulent secretion, and the general appearance of a section of both lungs presented from apex to base an appearance of yellow dots the size of a large pin's head, and marked by a central orifice, from which purulent fluid might be squeezed. Very little of pulmonary substance in either lung capable of holding air, and where it existed the tissue was extremely œdematous. In the Table the abnormal enlargement and high specific gravity of these organs point to the local lesion. A mass of solid tubercular disorganization at the apex of the left lung, measuring 4 cubic inches, had a specific gravity of 1·212.

A register is subjoined indicating the normal mean weight and specific gravity of the several internal viscera, in order that a comparison may be instituted with the annexed Tables; the weight, actually and specincally of the body is likewise stated. These data have been principally furnished from the researches of Kräuse and Reid, the columns of cubic dimensions and water of displacement having been calculated from them.

TABLE of average Weights and Specific Gravities of Organs.

Organs.	Weight in drachms, avoirdupois.	Volume in cubic inches.	Weight of Water displaced in drachms, avoirdupois.	Specific Gravity.
Brain, in the male.. ..	800	83·6	772·2	1·036
„ in the female ..	704	67·9	736	1·036
Heart, in the male.. ..	176	..	..	Not determined.
„ in the female ..	144	..	..	
Lung, right..	336	63·8	589·5	·570
„ left	304	57·7	533·3	
Liver	880	90·3	834·1	1·055
Spleen	96	9·8	90·5	1·060
Kidney, right	80	8·2	76·2	1·050
„ left				
Body, after full expiration.	36,352	3697	34133·3	1·065
„ after full inspiration.	36,355	3937	36353	1·00006

TABLES recorded by the Necrometer at the Army Medical School, Netley:—

TABLE I.—Private T. O'K. Age, 39. Disease, Abscess of Liver.

Organs.	Weight in drachms, avoirdupois.	Volume in cubic inches.	Weight of Water displaced in drachms, avoirdupois.	Specific Gravity.
Brain	824	81·75	754·78	1·091
Heart..	161	17·20	158·8	1·014
Lung, right	329	46·75	431·61	·762
„ left	309	40·75	376·23	·821
Liver..	1,572	164·5	1518·8	1·035
Spleen	257	26	240·05	1·070
Kidney, right	144	15·5	143·11	1·006
„ left..	113·5	11·8	108·95	1·042

TABLE II.—Private G. B. Age, 37. Disease, Urinary Fistula.

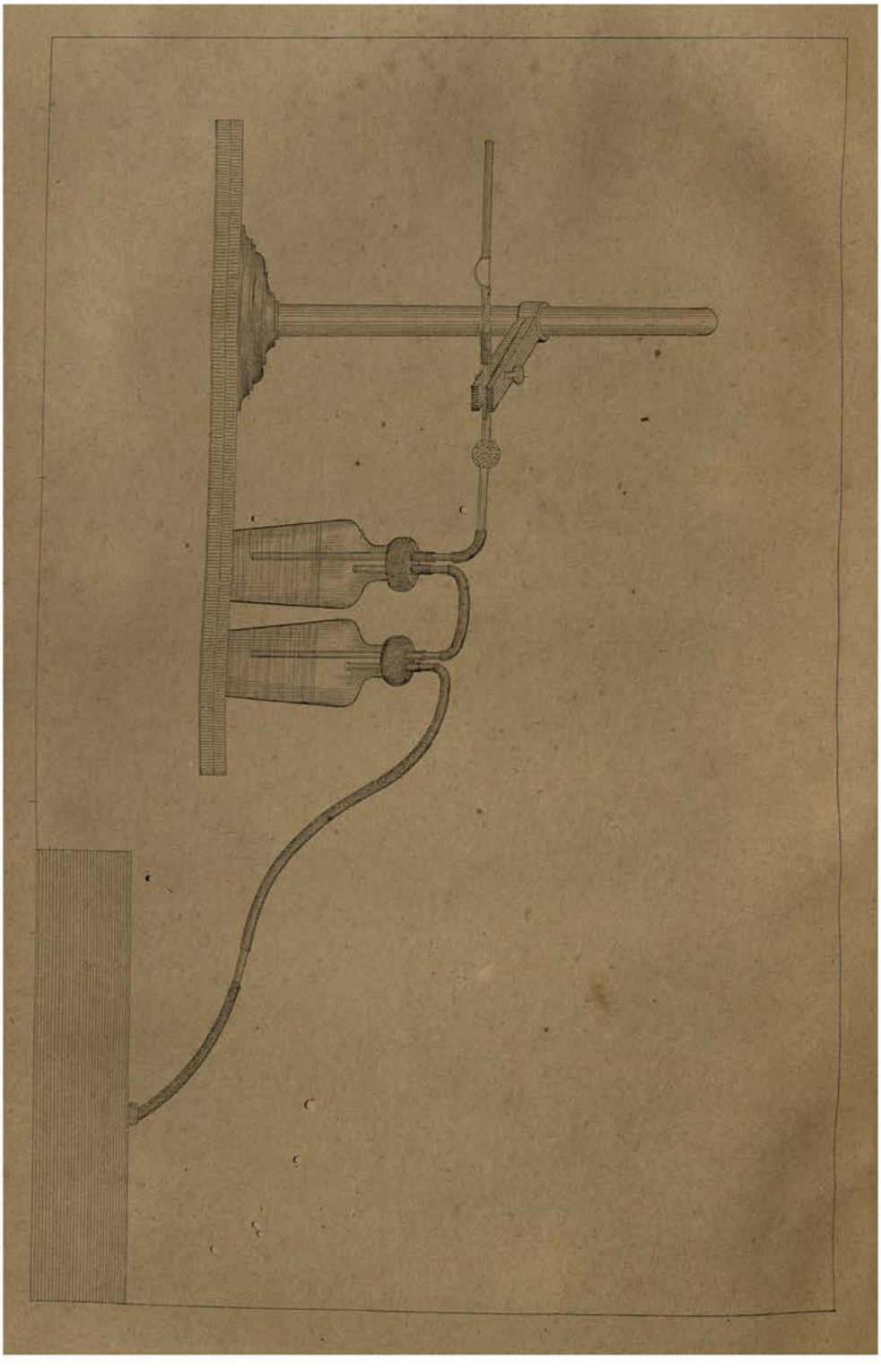
Organs.	Weight in drachms, avoirdupois.	Volume in cubic inches.	Weight of Water displaced in drachms, avoirdupois.	Specific Gravity.
Brain..	784	82	756·6	1·037
Heart	122	12·5	116·8	1·045
Lung, right	220	41	376	·585
„ left	192	32·2	297·67	645
Liver..	1,018	104·5	963·3	1·057
Spleen	263	26	240	1·095
Kidney, right	181	18	166·2	1·090
„ left	90	8·8	81·4	1·081
Testicle, right	17	1·6	15·75	1·080
„ left..	12·5	1·35	12	1·042

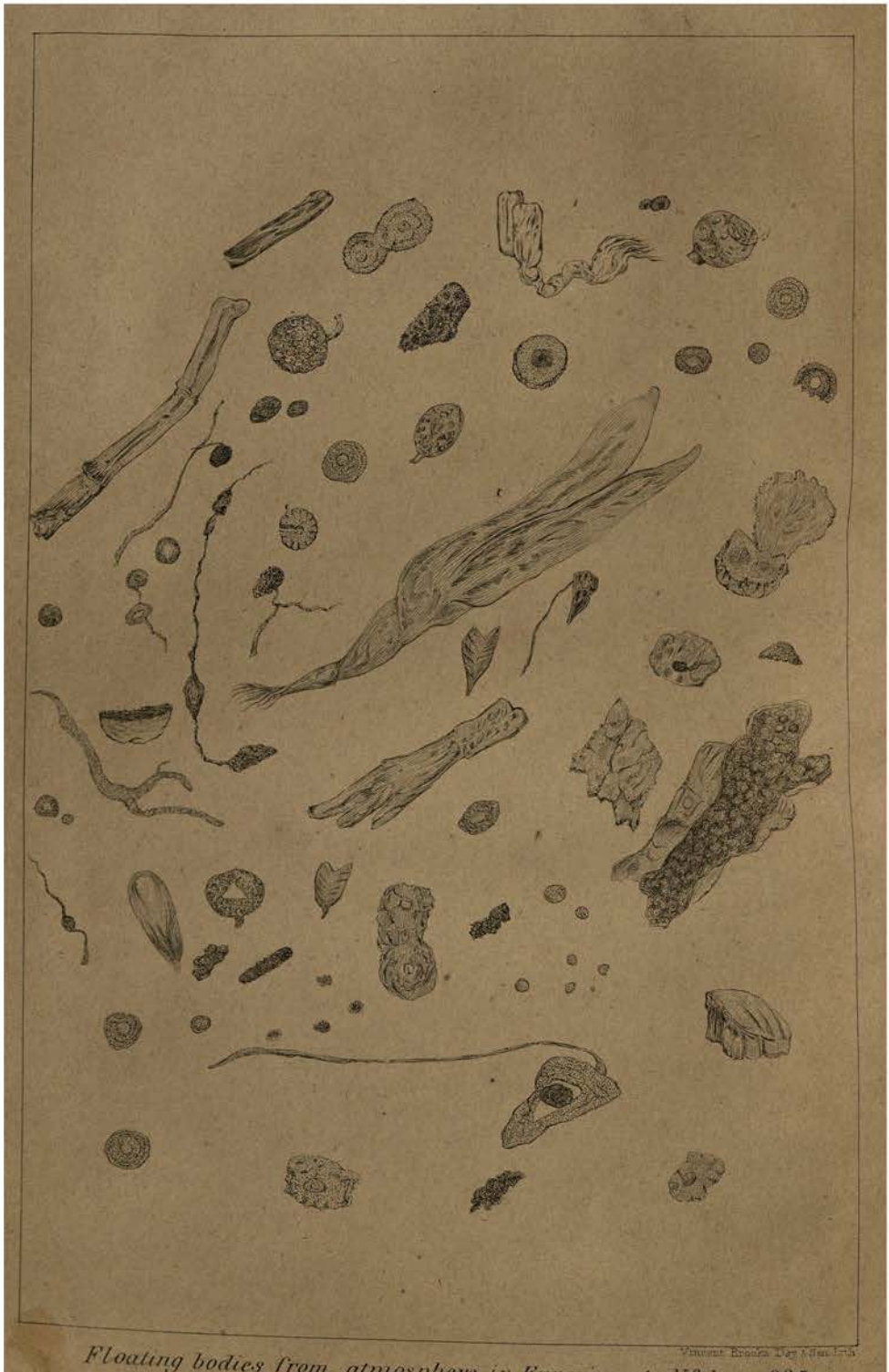
TABLE III.—Private T. M. Age 36. Disease, Paralysis, Insane.

Organs.	Weight in drachms, avoirdupois.	Volume in cubic inches.	Weight of Water displaced in drachms, avoirdupois.	Specific Gravity.
Brain..	824	87	802·53	1·027
Heart..	151	15·25	141·79	1·065
Lung, right	434	65	597·82	·726
„ left	316	60	553·93	·570
Liver..	972	99	913·32	1·064
Spleen	94	9·8	90·4	1·039
Kidney, right	80	8·25	76·15	1·050
„ left	74	7·6	70·4	1·051

TABLE IV.—Sapper T. R. Age 26. Disease, Phthisis Pulmonalis.

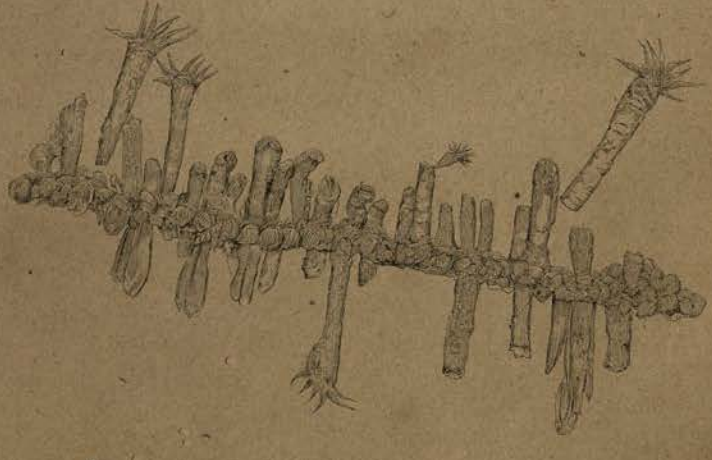
Organs.	Weight in drachms, avoirdupois.	Volume in cubic inches.	Weight of Water displaced in drachms, avoirdupois.	Specific Gravity.
Brain..	759	76	700·74	1·083
Heart..	187·5	19·8	182·2	1·029
Lung, right	681	81·5	751·4	·906
„ left	664	74·75	689·75	·962
Liver..	953	97·25	897·32	1·062
Spleen	120·5	12	111	1·085
Kidney, right	121	12	111	1·090
„ left..	97·5	9·5	89·4	1·090
Two Testicles	19·7	1·8	17	1·159





Floating bodies from atmosphere in Experiment N°1 × 225.
by Camera lucida at 10 inches.

From the air in Experiment N.º 2 × 335
by Camera lucida at 10 inches.



From the air in Experiment N.º 1 × 335
by Camera lucida at 10 inches.

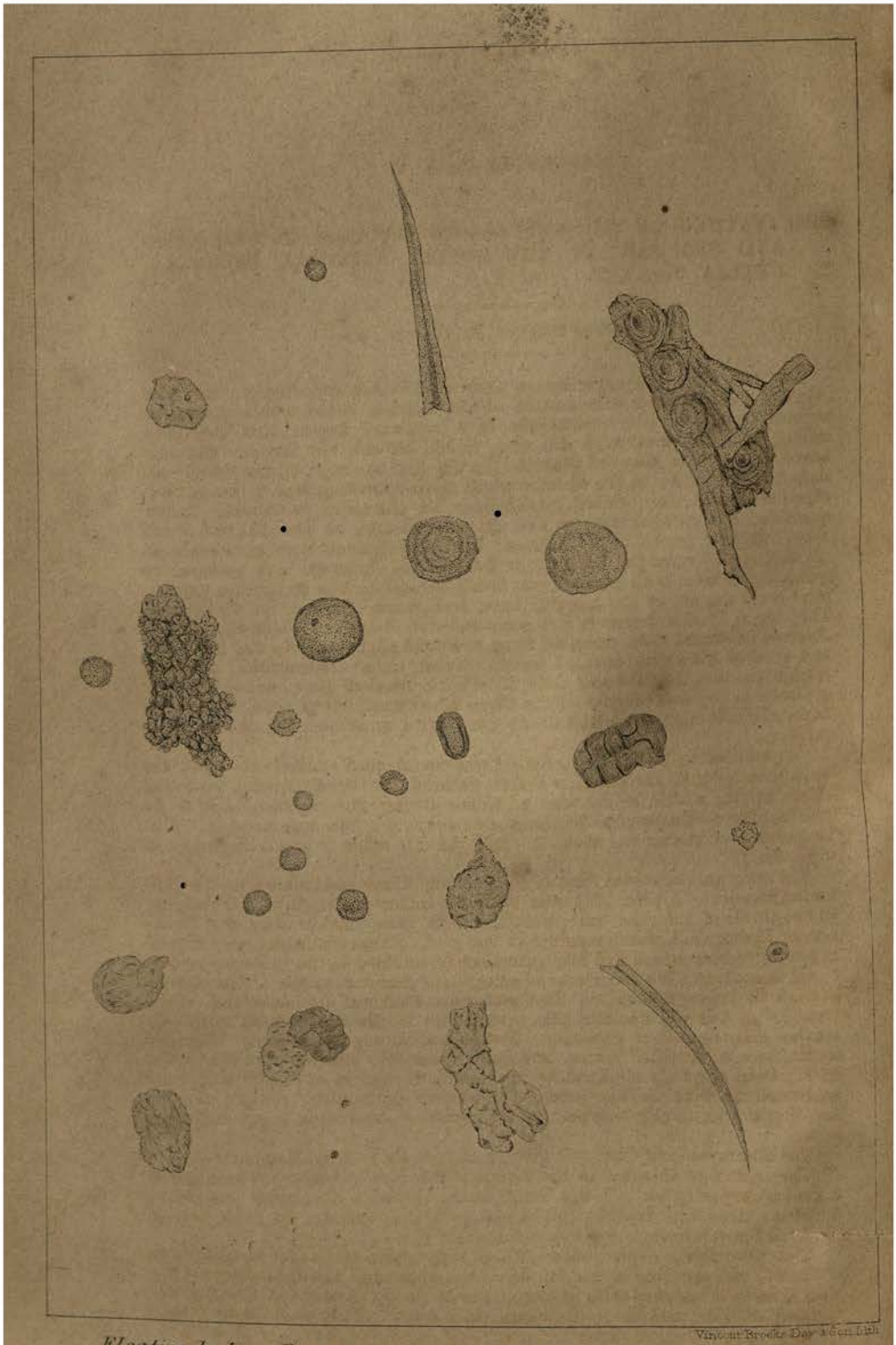
Vincent Brooks Day & Son Lith.

Vincent Brooks Day & Son Lith.

Floating bodies from the atmosphere in Experiment N.° 2 × 225 by Camera lucida at 10 inches.

Vincent Brooks Day & Son Lith.

Floating bodies from the air of a Barrack room at the Royal Victoria Hospital Netley in Experiment N° III_ × 225. by Camera lucida at 10 inches.



Vincent Brooks Day & Son Lith.

Floating bodies from the air of a ward filled with Phthisical Patients × 335 by Camera lucida at 10 inches

APPENDIX No. XXV.

OBSERVATIONS ON THE SUSPENDED MATTERS IN THE LAND AND SEA AIR AT THE ROYAL VICTORIA HOSPITAL, NETLEY, JUNE 1870.

By Staff Surgeon R. WATSON, H.P.

THE following two experiments were undertaken principally with the object of a comparative examination of the floating bodies which might be arrested from the outer atmosphere in a landward breeze, and that proceeding from the southward direction, which, though not directly the sea-breeze, was from a seaward quarter. In the first instance, as the detail will show, the impurities in the air were much more numerous than in the second experiment, and they varied considerably in character, containing larger quantities of vegetable matters and *débris* of insects, as also charred wood fibres from the smoke of wood fires. Both experiments were conducted at the end of the verandah running in front of the Laboratory, a position to which the air from both quarters was freely accessible, and in neither experiment could the air of the hospital have had much influence on the result. The objects in the drawings are some selected from the whole which were observed in several slides mounted from the fluid after washing the filaments and crushed glass with distilled water. From these observations, it would seem to me that the tube and bulb filled with crushed glass moistened with glycerine is the most effective of the three filters used, but probably in general experiments it might be advisable to use both a moist and dry intercepting medium.

Experiment No. 1.—This experiment was commenced on the 8th June, the apparatus being in the position before noticed, the wind blowing from the north, varying a little to the west at times during the operation, that is to windward of all the hospital buildings, and crossing a free open country. The temperature of the air was about 70°, and the difference between the wet and dry bulbs 12°.

The apparatus consisted first of a set of air filters constructed in the following manner:—A piece of ¼ inch tubing 5 inches in length with a bulging at two-thirds of the glass tube, was filled with glass threads about the thickness of ligature silk, fused together at one end. These filaments were dipped in pure glycerine which had been previously examined by the microscope and found to contain a few fragments of amorphous granular matter. The shorter limb of the tube was similarly filled with glass filaments, not moistened. Connected with this was a second tube with a bulb in the centre filled with thin crushed glass soaked in glycerine. Bottles containing respectively 100 cubic centimetres of distilled water, and lime water, the alkalinity of the latter having been carefully obtained by the standard solution of oxalic acid, were connected, as were the two tubes, by means of indiarubber tubing; and the last bottle was finally attached to an aspirator containing 1 cubic foot of water.

The accompanying draft will give an idea of the completed apparatus:—

The cubic foot of water in the aspirator was slowly discharged into one of a similar capacity on a lower level, which replaced the upper one when emptied. This was repeated 12 times, so as to represent 12 cubic feet of air in all drawn through the apparatus.

After completion of the process, which was carried on during the afternoon of the 8th and morning of the 9th June, the apparatus was disconnected; the glass threads moistened with glycerine placed in one test tube, the dry filaments in another, and the broken glass in a third. To each of these a little

distilled water was added, and the tubes agitated to wash off adherent particles. The three fluids containing the atmospheric floating bodies which were found thus to have been arrested were then separately examined by the microscope under a power of ×225. That in the first was found to contain quantities of nucleated cuticular scales both animal and vegetable, amorphous particles of carbon, and charred vegetable fibres; globular cells, from the most minute to larger, some with a clear nucleus and concentric rings; grains of silica or mineral crystalline fragments; pieces of vegetable fibre, many fragments of insects, and scales of various moths or butterflies were also noticed.

In the second or dry part of the glass epithelial scales were less numerous, and there was a considerable quantity of globular cells of various sizes and tints, also some fungi. The appearances presented by these intercepted structures as examined by the microscope × 225, and drawn by the camera lucida at 10 inches, are represented by the accompanying drawings.

Experiment No. II.—The second operation was begun at 1 P.M. on the 16th June, the wind being from the south-east; the dry bulb of the thermometer 72°, the wet bulb 65°.

On this occasion the apparatus consisted of a set of three air filters, the first in the series being a tube about 4 inches long, nearly filled with glass threads, which were left dry; the second contained glass filaments moistened with glycerine, and the third crushed glass similarly treated. The glycerine previous to use had been examined on several slides, and found to contain a very few amorphous granules and a scale or two of epithelium, no doubt arrested from the air of the microscope room, which was full at the time of mounting the slides. A bottle of distilled water was attached to the tubes that the air bubbles passing through it might show that the apparatus was working properly.

On the 17th June, when the 12 cubic feet of air had been drawn through the apparatus, the wind was south-west, light; there had been thunder and slight rain during the night. The thermometer 66° dry, and 61° wet bulb.

The experiment was completed at 1·30 P.M. and the tubes disconnected. The first set of filaments were removed and placed in a test tube, into which 2 cubic centimetres of boiled distilled water were poured. The second and third tubes were similarly treated.

On examination of the fluids by the microscope the first tube was found to contain cuticular scales, animal and vegetable, the latter of a slightly greenish tint, and some rounded globular bodies, analogous in appearance to those in the first experiment. In the second tube the particles were much more numerous, vegetable fibre, worn-looking, like drift-wood, scales, a very few of the concentric vegetable cells, and a minute fungus. In the third tube, that with the crushed glass, they were still more abundant—scales, carbon, insect fragments, and fine membranous envelopes, apparently seed capsules.

On the whole, however, the particles were very apparently much less numerous in this than in the previous experiment, probably because the air coming from the south, and so from a seaward direction, was freer from vegetable impurities and smoke.

The two drawings made from observations in this experiment show selected objects at × 225 and × 335; in the latter there is a considerable mesh of fungoid growth, and a good example of the protococcus pluvialis.

Part II.

This experiment on the air of a room was undertaken in continuance of the experiments on the external air, and was carried on during the night of the 18th July, commencing at 10 P.M. and terminating at 6 A.M. on the morning of the 19th. The barrack-room chosen was one calculated to contain 16 men, with an allowance of rather less than 600 cubic feet per man, and there were 16 men in the room during the process. The means of ventilation were one Sheringham valve, measuring 9½ × 6 inches outside, and two outlet shafts 8½ inches square, besides the chimney and a circular outlet in the ceiling over the gas; the windows and door were kept closed.

In this instance the apparatus consisted of a glass tube six inches in length filled with dry glass filaments; then a tube and small bulb con-

taining crushed glass moistened with glycerine, connected as in Experiment No. 1, with bottles containing distilled water and lime water for the ammonia and carbonic acid; these, in turn, were attached to the aspirator, and the process of drawing the air through the apparatus was commenced at 10 P.M., when the men were all in bed. It was carefully conducted during the night, with the aid of Serjeant Turner, Army Hospital Corps, under my superintendence, and discontinued at 6 A.M. on the 19th, when the men got up. By this time just 9 cubic feet of air had been drawn through the apparatus, which was placed about the centre of the room. During the night the breeze was from the southward, and it was occasionally very light. The mean temperature of the dry bulb thermometer in the room during the time was 70° Fahr., that of the wet bulb 65°.

It was the intention to endeavour to make a comparison between the particles in the air of the inlet and outlet openings by arresting them on slides moistened with a carefully-prepared glycerine jelly, which were placed in wooden stands in the manner indicated by the accompanying drawing. The Sheringham ventilator was found to be acting as an occasional inlet; the ordinary outlet shafts showed no movement of air, and accordingly at midnight one stand with three slides and an air meter were placed in the floor of the Sheringham opening, with the moistened surface of the glass outwards. Another set of slides and air meter were exposed in the opening of the chimney, which was found to be a very powerful outlet, the smeared surface of the glass facing inwards. The stands and anemometer were removed from the outlet at 12·30 A.M., and from the Sheringham ventilator at 1 A.M., when it was found that the latter had been playing the part of an outlet much more than that of an inlet, as the air meter had lost nearly 1,000 feet; the wind and pressure of air were on the opposite windows and door. In this case, no accurate comparison could be made of the intercepted matters from the air actually passing into the room and that which was escaping by the outlets. The slides, on removal from the stands, were placed in a small box to prevent access of other air until they were examined, the apparatus was disconnected, and the glass filaments and crushed glass were respectively washed in test tubes with 2 cubic centimetres of boiled distilled water, and the result, after agitation, examined by the microscope. A marked difference was at once observed between the products of the operation in the air of the room and those of the experiments on the outer air; vegetable matters were less abundant, mineral particles not so numerous, probably because in the stiller air of the room they tend to fall rapidly; whilst irregular amorphous molecules were in greatly increased numbers, and epithelial scales, single and in tesselated masses, were found in plenty. The examination also showed cotton, linen, and wool fibres from articles of clothing, dyed of various colours, ragged nondescript fragments, possibly from the same source, bits of human hair, a very few spores of fungi, and broken filaments of mycelium; but perhaps the most distinguishing characteristic of this result, as compared with that of the outer air, was the existence in considerable numbers of round yellowish cells not unlike mucous corpuscles but much larger, usually globular, at times with a nucleus, and in one or two examples presenting a slight prominence at one side. No similar objects were observed in the previous experiments; they were treated with iodine, as it was thought possible that they might be some form of starch granules, but no blue reaction followed. Besides these, there were found some dark purple, almost black, corpuscles of smaller, but varying size, the larger showing a clearer centre, and some smaller a rather rugose surface. The slides from the outlet current showed aggregations of dust particles, mineral fragments, ragged fibres, and a few of the globular bodies just mentioned. For the reason previously noticed the examination of the inlet slides was not considered satisfactory in this instance. In this experiment perhaps the largest amount of floating bodies was intercepted by the dry glass threads. Most of the objects mentioned in the foregoing observations are illustrated by examples in the enclosed drawing taken by the camera lucida with a power of ×225, and coloured according to the natural appearance.*

* The originals were drawn in water colours.

PART III.

On the Air of a Ward containing Cases of Phthisis Pulmonalis at the Royal Victoria Hospital, Netley.

Experiment No. IV.—The ward in which this operation was conducted was one adapted for nine beds; it had two large Sheringham valves and two outlet shafts, besides the chimney, which, as in a previous experiment, was found to be acting as a very efficient outlet, with occasional exceptions when the current of air was downwards.

There were eight patients in the ward duing the process, all suffering from phthisis, and usually one or two other healthy persons, including the ward orderly and those attending to the apparatus.

The appliances in this instance were in sequence—1st, a fine glass brush, such as is used for acids, in a tube fitted to it; 2nd, a short tube filled with glass filaments; and 3rd, a tube and bulb filled with crushed glass and glycerine. To these were added a bottle with 100 cubic centimetres of distilled water and a second with 100 cubic centimetres of lime water, the whole connected, as before, with an aspirator of 1 cubic foot.

At 11 A.M. on the 26th July the process was commenced in the middle of the ward, the doors and windows being as far as practicable kept shut whilst it was going on. The wind was from the north-east, light; the thermometer, 74° dry bulb, 68° wet bulb.

At 2 P.M. an attempt was made, as in the preceding experiment in the barrack-room, to establish a comparison between the matters in the air coming into the ward and that issuing from it by placing slides moistened with glycerine in the different shafts, but it was found that both Sheringham's valves and the outlets proper acted indifferently as inlets or outlets, and at last three slides were exposed in the entrance to the chimney, as the most active outlet, and a set of three in the corridor from which the ward opened. With each stand of slides was one of Casella's anemometers, and they were withdrawn when 2,500 feet of air had passed. This calculation was a little uncertain as regards the outlet instrument, as its action had been occasionally reversed by downset currents, for which allowance had to be made.

At the termination of the process the three intercepting media were placed in clean test tubes carefully closed for examination next day. A cubic centimetre and a half of distilled water which had been boiled were placed in each tube, and adherent particles washed off by shaking; the results were then examined by the microscope with powers × 225 × 335.

The dry brush glass was found to have intercepted minute particles, some epithelial scales, and a few globular cells having the appearance of pus corpuscles. The second tube in the series, namely, that with the dry filaments of glass, was more abundantly furnished with arrested matters, and supplied more objects for inspection than either of the others. In this there were a very few large globular cells, some with a nucleus, which had all the appearance of those which were found to be more prevalent in the night air of the barrack-room, and the pus corpuscles were in greater number; some of these were partly dried, and presented an irregularly polygonal outline with a darkened centre. These bodies were compared with ordinary pus cells, and found to correspond with them in size and appearance unless when partly desiccated. Clusters of irregular cells were noticed filled with molecular matter, and occasionally showing a nucleus, resembling the degenerate cells of tubercle. Vegetable hairs, and a membranous form of vegetable origin with concentric rings, were frequently met with. Mineral matters seemed to be less numerous. A few oblong fungus spores of a brownish tint were observed. The third tube, with the crushed glass and glycerine, contained a fair proportion of particles presenting the same relative appearances as those found in the second tube.

The slides which had been exposed in the outlet air and those from the corridor were also subjected to particular inspection; the former exhibited many groups of dust particles caught by the glycerine, a good deal of fine siliceous and mineral matter, some frayed fibres of clothing, and a few pus cells. The glasses exposed in the corridor showed fewer impurities, and these

were more of the kind found in the outer air experiments. It may here be remarked that no trace of ammonia was found by Nessler's test in the distilled water used in this instance. In the examination of the outer air the quantity found was only the 300th of a milligramme in 12 cubic feet; in the barrack-room air the amount was 900ths of a milligramme in 9 cubic feet.

The drawing, which is on a scale of ×335, by the camera lucida at 10 inches, represents some of the numerous objects found in the examination of the results from the three air filters.

On revising the experiences taught by the foregoing examinations of the air which we breathe under four different states, one is struck by the apparent readiness to change which the character of the floating impurities undergoes under various extraneous conditions, such as the rate of movement of the air, moisture, and the existence of men in a confined space. Each experiment undoubtedly gave its characteristic type of impurities, though some, particularly epithelial scales, were common to all.

Many fragmentary forms were observed, which could not be defined or described; and it is difficult to conceive a limit to the number and variety of minute bodies which may be wafted about by every breeze, and find their way into the pulmonary cells.

One difficulty experienced in such examinations is to give an approximate idea of the quantity of these impurities in any given operation; in these experiments only a relative comparison can be instituted.

The floating bodies were most numerous in the land air and in that from the barrack-room; but in comparing the former with the air from the sea it might perhaps be desirable to state that the wind was not quite so strong in the latter case, and no doubt a strong breeze will influence the amount, especially of the heavier impurities which the atmosphere contains.

In the first operation, then, it may be said that the type of the impurities was the preponderance of vegetable cells and fibres, pollen and fungi; in the second the character of the particles was the same, but the vegetable products were much diminished. The typical floating bodies of the barrack air seem to be large globular cells, ragged, nondescript filaments and fibres from the clothing; whilst in the air from the phthisis ward we come upon forms which had not been observed in any of the other examinations in the shape of pus corpuscles, and to all appearance the peculiar cells of tubercle, and it is not difficult to believe that the existence of these structures in the atmosphere and their inhalation may tend, under certain conditions, to the propagation of this disease by what we may call infection.

APPENDIX No. XXVI.

ON THE COMPARATIVE USE OF CERTAIN DRUGS IN THE ARMY AT HOME.

THESE Tables have been compiled on the same principle as those published in previous Reports. Like them, they show the greatest diversity in the expenditure of certain drugs in some corps as compared with others, and a marked predilection in some instances for particular preparations as contrasted with others of the same drug having identical therapeutic properties.

A careful analysis of the Tables already published appears to favour the opinion held by many Medical Officers that the List of Drugs now issued might be considerably curtailed without any material risk of injury to the sick soldier.

TABLE showing the quantities of certain MEDICINES used by the following Corps serving at Home during the year 1869-70—*continued*.

Strength	1st Life Guards 800	2nd Life Guards 809	Royal Horse Guards 811	6th Dragoons (Guards) 524	1st Dragoons 533	3rd Dragoons 520	5th Hussars 529	9th Lancers 530	12th Lancers 525	Gren. Guards 3427	Coldst. Guards 3007	Scots Fus. Guards 3016	1st Batt. 15th Regt. 952	2nd Batt. 30th Regt. 1008	3rd Batt. 57th Regt. 1008	1st Batt. 3rd Regt. 636	2nd Batt. 23rd Regt. 614	1st Batt. 24th Regt. 621	42nd Regt. 613	43rd Regt. 638	48th Regt. 625	49th Regt. 626	51st Regt. 626	54th Regt. 626	69th Regt. 626	91st Regt. 657	97th Regt. 615	98th Regt. 628	100th Regt. 643	105th Regt. 654	
Iodum	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	Iodum
Ipecacuanha [contrit.]		0 14		0 1	0 1	0 1	0 2			0 6	0 24	0 2	0 16	0 6	0 1	0 1	0 24		0 2	0 6			0 6			0 1	0 6	0 14	0 1	0 6		Ipecacuanha [contrit.]
Jalapa [contrit.]			0 2	0 1	1 0	0 0	2 0	0 8	0 4	0 1	1 8		0 8		0 6		2 14	0 8	0 8	0 5	0 8	0 8	0 4				1 7	0 4		0 1		Jalapa [contrit.]
Lini Farina	280 0	176 0	90 0	221 0	148 0	176 0	135 0	168 0	840 0	784 0	620 0	135 0	157 0	56 0	371 0	180 15	161 0	62 0	148 0	148 0	190 0	74 0	95 0	234 0	81 8	167 0	56 0				Lini Farina
Liniment : Saponis	10 0	2 12	12 0	6 0	4 0	4 0	3 0	4 0	12 12	17 0	14 0	2 0	8 2	8 4	8 0	12 8	8 12	4 0	4 0	4 0	4 0	4 0	4 0	8 2	15 12	7 0	4 0	2 12			Liniment : Saponis
Liquor Ammoniæ	4 0	2 0	0 12	1 24	1 6	2 0	2 0	1 0	0 14	3 6	2 0	0 6	1 2	1 0	1 12		1 10	1 8		0 12	2 0	3 2	3 0	1 10	1 2	0 10	0 8	2 12				Liquor Ammoniæ
——— Acetatis	4 0	2 0	0 12	1 24	1 6	2 0	2 0	1 0	0 14	3 6	2 0	0 6	1 2	1 0	1 12		1 10	1 8		0 12	2 0	3 2	3 0	1 10	1 2	0 10	0 8	2 12				——— Acetatis
——— Arsenicalis				0 24	0 1	0 1	0 2		0 2		0 8	0 1	0 4		0 4		0 8		0 5	0 5	0 5	0 5	0 5	0 12		0 1	0 1	0 14	0 1			——— Arsenicalis
——— Phenic Subnatratis	4 0	1 0	2 0	1 1	0 8		1 0	0 6	0 6	0 6	0 6	0 3	0 14	0 4	1 4	2 0	1 0	1 2	1 6	0 7	1 2	0 10	0 11		1 8		0 8				——— Phenic Subnatratis
——— Potassæ	9 12	4 0	2 0	2 8	0 8	1 12	1 8	1 0	1 0	2 0	1 0	0 4	2 0	1 0	2 0		2 0	1 0	1 12	1 4	2 4	2 4	2 4		1 8	0 10	0 8	1 0			——— Potassæ
——— Sodæ Chloratis	0 8	1 0		1 2			0 4	0 4	0 2	0 2	0 4	1 0	0 2		0 2		0 10		1 2	0 2		0 8	1 0	0 12	0 4	0 2				——— Sodæ Chloratis
——— Sodæ [Hydric]		0 4				0 2																								——— Sodæ [Hydric]
——— Zinci Chloridi	1 0		4 0	2 8	1 0	1 0		1 0	1 0	1 0			0 10				1 0		4 8	0 2		2 0					2 8	2 2			——— Zinci Chloridi
Magnesia	0 8				0 2					0 4		0 2				0 4		0 2						0 2	0 2			0 2	0 6		Magnesia
Magnesiæ Carbonas	3 4	0 4	0 4	0 8	0 14	0 12	1 0	0 11	11 8	2 0		1 8	0 1	0 21	0 13	0 8	0 15	0 12	0 4	0 10	0 11	0 13	0 4	0 6				0 11			Magnesiæ Carbonas
Sulphas	24 0	7 0	0 8	0 8	0 8	0 8	0 8	0 8	0 8	2 0	0 60	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	Sulphas
Morph.: Hydrochloras	0 2		0 0	0 0	0 1	0 2	0 0	0 0	0 0	0 1	0 0	0 0	0 0	0 0	0 0	0 0	0 1		0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	Morph.: Hydrochloras
Ol.: Anisi					0 1	0 1				0 0	0 0		0 1	0 0	0 1		1 0	0 0	0 0	0 1		0 0		0 1	0 1	0 0		0 0			Ol.: Anisi
——— Crotonis			0 1	0 0						0 1	0 2						0 2							0 1		0 1	0 0				——— Crotonis
——— Menthæ piperitæ	0 0	0 24	0 1	0 2	0 2	0 2	0 2	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 1	0 2	0 1	0 0	0 0	0 1	0 0	0 0	0 1	0 2	0 1	0 1	0 0	0 0	0 0	——— Menthæ piperitæ
——— Morrhuæ	25 0	0 0	28 0	14 8	16 0	0 0	20 0	18 0	10 0	134 0	130 0	16 0	0 0	0 0	24 0	24 8	44 10	28 0	15 0	22 0	11 0	20 0	0 0	19 0	28 0	25 8	35 4	50 0			——— Morrhuæ
——— Olivæ	12 0	2 0	0 8	2 0	1 0	1 0	1 0	1 0	0 8	4 0	0 0	0 0	11 0	0 0	0 0	0 0	0 0	0 0	17 0	0 0	0 0	0 0	0 0	7 0	16 0	0 0	0 0	0 0			——— Olivæ
——— Ricini	35 0	24 0	12 0	18 0	14 0	20 0	34 0	24 0	12 0	32 8	56 0	20 0	0 0	0 0	28 12	27 0	25 0	25 0	10 0	11 8	20 0	23 4	30 0	17 0	16 0	16 0	28 12	24 0			——— Ricini
——— Terebinthinæ	13 0	4 0	4 0	7 3	4 0	0 0	10 0	6 0	3 0	2 0	4 0	1 0	2 8	0 0	7 0	7 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0	4 0			——— Terebinthinæ
Opium [contrit.]			0 2	0 1	0 2	0 2				0 0	0 14		0 4		0 4		0 4		0 1	0 4			0 2	0 0	0 1	0 0	0 1	1 0			Opium [contrit.]
Pilula Hydrargyri	0 0	0 3	0 1	0 1	0 1	0 6	0 11	0 4	0 11	1 0	0 2	0 4	0 2	0 1	0 2	0 2	0 10	0 7	0 8	0 4	0 2	0 2	0 2	0 8	0 6	0 4	0 6	0 4	0 2	0 4	Pilula Hydrargyri
——— Subchloridi comp.				0 1	0 1	0 2	0 2	0 2					0 2	0 3			0 2	0 3		0 1	0 2	0 1	0 0	0 4	0 4	0 1	0 2	0 2			——— Subchloridi comp.
——— Rhei compositæ	0 12		0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	1 0	0 0	0 14		0 14		0 14		0 4	0 8	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	——— Rhei compositæ
Pilulæ Aloes			0 2	1 0	0 4			0 7	0 0	0 8			0 1	0 2	0 8	0 14	1 0	0 6	0 4			0 12	0 8	0 2	0 8	0 2	0 11			Pilulæ Aloes
Potassæ Acetas	0 4	0 10		0 2		0 1	0 2		0 1	0 4			0 7		0 2	1 0	0 12							0 4	0 2	0 8	0 2	0 4			Potassæ Acetas
——— Bicarbonas		0 20		0 2		0 1	0 2			0 8	0 4		0 4		0 2	1 0	0 12									0 8	0 2	0 4			——— Bicarbonas
——— Citras	0 8	0 8		0 2	0 2	0 2	0 2	0 2	0 2	0 4	0 6	0 2	0 8		0 8	1 8	0 8		0 5	0 1	1 2	1 7	1 5			0 8	0 2	0 4			——— Citras
——— Tartras Acida				0 1	0 1	0 14		0 0	0 0	0 8		0 1	0 14		0 1	0 8	0 10	0 8	0 1	0 8	0 1		1 4		2 0	0 2	0 7	0 8			——— Tartras Acida
——— Chloras	0 4	0 0	0 4	0 2	0 2	0 2	0 2	0 2	0 2	0 4	0 6	0 2	0 8	0 4	0 2	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4	0 4			——— Chloras
Potassæ Caustica				0 0	0 1	0 1							0 1	0 2	0 0		0 0	0 2			0 0	0 1		0 0		0 0		0 0			Potassæ Caustica
Potassæ Nitras	0 8	0 8	1 0	0 8	2 0	0 8	1 12	0 14	1 0	2 0	4 0	0 8	2 12	0 10	1 12	2 0	2 0	1 0	1 0	0 8	1 0	0 8	0 8	4 2	3 8	1 2	0 8	1 0			Potassæ Nitras
Potassæ Iodidum	1 0	0 8	0 12	0 15	3 12	2 8	2 8	0 8	2 0	11 0	0 0	0 0	0 0	0 0	2 12	2 0	1 4	2 12	7 10	1 12	3 0	3 12	4 0	4 8	2 12	3 8	2 11	2 12	1 0		Potassæ Iodidum
Pulvis Antimonialis													0 1		0 1		0 2	0 2	0 2					0 2		0 1		0 1			Pulvis Antimonialis
——— [Jacobi]				0 0	0 0	0 0	0 3	0 2	0 3	0 2	0 3	0 2	0 2		0 2		0 2	0 2	0 2	0 2	0 2			0 2	0 2	0 2	0 2	0 2	0 2			——— [Jacobi]
——— Cretæ Aromaticus	2 0	0 4		0 4	1 0		0 4	0 4	0 3		6 4	1 0	1 4			0 3	0 4	1 0	0 4	0 8	0 0	0 11		0 0			0 0	0 7			——— Cretæ Aromaticus
——— Cretæ Aromaticus cum Opio	0 0	0 2		0 2	0 2		0 2	0 2	0 2		0 2	0 2	0 2			0 2	0 2	0 2	0 2	0 2	0 2	0 2		0 2	0 2	0 2	0 2	0 2			——— Cretæ Aromaticus cum Opio
——— Ipecacuanhæ comp.			0 4	0 8	0 8	0 4	0 0	0 4	0 2	0 2	1 0	0 4	0 2		0 2	0 2	0 2	0 2	0 2	0 2	0 2	0 2		0 2	0 2	0 2	0 2	0 2			——— Ipecacuanhæ comp.
——— Kino comp.			0 4	0 8	0 8	0 4	0 4	0 4	0 2		0 4	1 0	0 4			0 2	0 4	0 4	0 4	0 4	0 4	0 4		0 4	0 4	0 4	0 4	0 4			——— Kino comp.
Quassiæ [Cortex]		1 12		0 2	0 8	0 4	0 0	0 12		7 4			0 6		1 0		2 0	2 4	0 4	0 2	0 0		0 8	0 2	2 0	0 14		0 2	0 4		Quassiæ [Cortex]
Quinæ Sulphas	0 12		0 12	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 24	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8	0 8			Quinæ Sulphas
Rhei Radix [contrit.]			0 6	0 2	1 14	0 12	0 7	0 14	0 8	0 2	4 8	1 8	1 12	0 1	0 2	0 2		0 14	0 3	0 2	0 4	0 2		0 7		0 3	0 2	0 4	0 4			Rhei Radix [contrit.]
Sacchromum [contrit.]	0 7	0 14	0 1					0 14		0 1			0 1		0 2				0 15		0 1			0 0	0 3	0 0	0 2	0 1			Sacchromum [contrit.]
Sodæ Carbonas [contrit.]										0 1			0 1		0 1				0 0	0 0	0 0	0 0		0 1		0 0	0 0	0 0			Sodæ Carbonas [contrit.]
Senna				2 24	2 0	3 0	2 0	2 0	2 0	0 0	0 0	0 0	0 0	4 0	2 0	0 0	1 12	0 8	1 12	0 8	1 0	0 8	1 0	0 8	1 0	1 0	1 12	1 12	0 8			Senna
Sinapis [contrit.]	28 0	24 0	4 0	10 0	12 0	12 0	12 0	12 0	12 0	56 0	56 0	12 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0			Sinapis [contrit.]
Sodæ Bicarbonas	8 0	8 0	2 4	0 10	1 0	0 14	1 0	0 14	1 4	7 0	4 0	0 14	2 0	1 0	2 0	1 4	3 0	2 0	2 0	2 15	2 4	1 0	3 5	2 4	0 0	1 0	3 0	1 0			Sodæ Bicarbonas
Sodæ Tartaratæ				0 2	0 1	0 1	0 1	0 1	0 1	0 2	0 2	0 1	0 2	0 1	0 2	0 1	0 2	0 1	0 2	0 1	0 2	0 1	0 2	0 1	0 2	0 1	0 2	0 1			Sodæ Tartaratæ

TABLE showing the quantities of certain MEDICINES used by the following Corps serving at Home during the Year 1869-70—*continued.*

	1st Life Guards.	2nd Life Guards.	Royal Horse Guards.	8th Hussars.	1st Drag.	2nd Drag.	5th Lancers.	9th Lancers.	12th Lancers.	Coldst. Foot Guards.	Scots Fus. Guards.	1st Batt. 60th Rifles.	2nd Batt. 60th Rifles.	1st Batt. 1st Regt.	2nd Batt. 1st Regt.	23rd Regt.	24th Regt.	41st Regt.	44th Regt.	46th Regt.	51st Regt.	54th Regt.	69th Regt.	91st Regt.	97th Regt.	98th Regt.	100th Regt.	101st Regt.	
Strength	400	309	401	534	533	529	529	530	533	2417	1067	1818	692	598	696	619	621	613	628	625	626	626	628	657	615	628	643	654	
Spiritus Ætheris	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	lb. oz.	Spiritus Ætheris
—— Ætheris Nitrosi	0 6	0 0	0 0	0 12	0 12	0 7½	2 6	2 0	4 0	0 8	2 4	1 0	0 8	0 4	0 12	0 8	0 8	0 12	0 6	0 4	0 0	0 0	0 1	0 2	1 2	0 7½	0 8½	0 10	—— Ætheris Nitrosi
—— Chloroformi	0 6	0 3	0 0	0 14	0 15½	0 4	0 5	1 4	2 4	0 8	1 12	3 6	0 8	1 8	0 4	1 2	1 11½	0 6	0 10	0 15	1 4	2 2	0 14	0 15	0 8	1 14	1 2½	—— Chloroformi
—— Ammoniæ Aromaticus	0 6	0 3	0 0	0 14	0 15½	0 4	0 5	1 4	2 4	0 8	1 12	3 6	0 8	1 8	0 4	1 2	1 11½	0 6	0 10	0 12	0 15	2 2	0 14	0 15	0 8	1 14	1 2½	—— Ammoniæ Aromaticus
—— Rectificatus Pts.	2	2	11	2	2	3	4	2	11	4½	6	6½	1	14	2½	4	4½	2	1	2	2½	1½	3	2½	2½	2	2½	2	—— Rectificatus
[—— Menthæ Piperitæ]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[—— Menthæ Piperitæ]
Sulphur	0	0	0	8	0	8	1	0	3	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Sulphur
Syrupus Ferri Iodidi	0	0	2	8	0	8	1	0	3	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Syrupus Ferri Iodidi
Tinctura : Camphoræ comp	3	0	6	0	1	8	4	8	6	0	4	0	8	0	4	0	2	0	1	0	0	0	0	0	0	0	0	0	Tinctura : Camphoræ comp
—— Cantharidis	0	0	2	0	0	4	0	8	0	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Cantharidis
—— Cardam : composita	2	0	2	0	0	4	1	2	0	0	2	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Cardam : composita
—— Catechu	2	0	2	0	0	4	1	2	0	0	2	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Catechu
—— Cinchonæ comp	2	0	2	0	0	4	1	2	0	0	2	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Cinchonæ comp
—— Colchici Seminum	0	0	0	8	1	8	0	4	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Colchici Seminum
—— Digitalis	0	0	1	0	0	4	0	8	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Digitalis
—— Ferri Perchloridi	4	0	4	8	1	0	8	0	4	0	2	0	4	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	—— Ferri Perchloridi
—— Gentianæ comp	4	0	4	8	1	0	8	0	4	0	2	0	4	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	—— Gentianæ comp
—— Hyoscyami	2	0	2	0	0	4	1	0	2	0	2	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Hyoscyami
—— Iodi	0	0	0	12	0	6	0	8	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Iodi
—— Lavandulæ : composita	0	0	2	0	0	4	0	8	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Lavandulæ : composita
—— Myrrhæ	0	4	0	10	0	7	1	2	0	0	3	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Myrrhæ
—— Opii	0	2	0	6	0	3	0	4	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Opii
—— Rhei	1	0	1	8	0	4	0	6	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Rhei
—— Scillæ		4	0	8	0	4	0	6	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Scillæ
—— Senæ		4	0	8	0	4	0	6	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Senæ
Vinum Antimoniale	1	0	4	0	2	12	0	8	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Vinum Antimoniale
—— Colchici	0	1	1	4	0	12	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Colchici
—— Ipecacuanhæ	7	0	2	0	2	8	0	8	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Ipecacuanhæ
—— Opii		4	0	8	0	4	0	6	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—— Opii
Ung : Cetacei	2	0	2	0	4	0	11	8	12	12	20	0	21	0	12	0	8	2	31	4	35	0	0	0	16	0	23	0	Ung : Cetacei
—— Resinæ			0	6	0	12	0	8	0	2	3	2	1	2	0	5	4	10	1	8	5	4	2	12	2	8	0	10	—— Resinæ
—— Hydrargyri	1	0	1	8	2	0	1	0	1	14	0	14	2	0	1	8	1	4	1	0	2	8	7	4	3	0	2	8	—— Hydrargyri
—— Nitratis	0	4	0	8	0	8	0	8	0	4	2	1	0	2	0	2	0	2	0	2	0	2	0	2	0	2	0	2	—— Nitratis
Zinci Sulphas	0	2	1	0	1	8	0	1	0	1	0	0	8	0	7	4	0	2	0	0	6	0	11	0	5	0	8	0	Zinci Sulphas
Zingiber [contrit :]	0	4	0	8	0	2	1	0	5	0	12	0	10	0	8	1	2	0	4	0	4	0	12	0	8	0	8	0	Zingiber [contrit :]
Lint, Fine	lbs. 6		4		1		7		13		11		16		8		8		20		36		29		14		18		6	Lint, Fine
—— 2nd		4	32		12		16		75		11		13		121		51		70		22		13		6		3		—— 2nd
Surgeon's Tow		19	21		5		18		36		97		47		62		24		30		18		24		11		9		Surgeon's Tow
Skins of Leather	No.	4		3		2		6		3		21		4		2		1		2		4		2		2		4	Skins of Leather
Adhesive Plaister, spread	Yds.	1	10		5		20		15		20		24		18		14		73		34		40		12		15		Adhesive Plaister, spread
Soap Cerate Plaister, spread		3		3		2		8		4		8		2		2		1		4		4		2		2		2	Soap Cerate Plaister, spread
Isinglass Plaister																													Isinglass Plaister
Surgeon's Sponges	No.	17	14		6		14		8		12		10		7		24		34		10		12		15		7		Surgeon's Sponges
Bandages, Calico		72	54		30		40		16		42		54		37		28		194		128		100		16		46		Bandages, Calico
—— Flannel		6	14		11		24		16		32		18		18		13		86		24		28		11		14		—— Flannel
—— 18-tailed																													—— 18-tailed
Flannel for Fomentations	Yds.	3	9		2		3		4		7		6		5		5		21		20		17		6		7		Flannel for Fomentations
Surgeons' Bandages		15	7		3		7		6		14		13		43		30		62		4		2		2		2		Surgeons' Bandages
Oiled Silk	Yds.	2	21		1		1		1		1		1		5		4		21		13				1		2		Oiled Silk
V. I. R. Cloth		3	6		2		2		4		3		3		5		3		12		7		11		2		2		V. I. R. Cloth
Gutta Percha Tissue		1	1		1		1		1		1		1		1		1		2		1		1		1		1		Gutta Percha Tissue
Carded Cotton	lbs.	1	0		2		2		2		2		2		2		2		2		2		2		2		2		Carded Cotton

APPENDIX No. XXVII.

THE ALEXANDER MEMORIAL FUND.

COMMITTEE.

Sir T. GALBRAITH LOGAN, K.C.B., M.D., Honorary Physician to the Queen, Director-General, *President.*
Deputy Inspector-General T. G. BALFOUR, M.D., F.R.S.
Deputy Inspector-General, T. LONGMORE, C.B., Professor of Clinical Surgery.
Surgeon-Major J. A. BOSTOCK, M.D., Scots Fusilier Guards, Honorary Surgeon to the Queen.
Deputy Inspector-General T. CRAWFORD, M.D.
Staff Surgeon-Major W. J. FYFFE, M.D., Assistant Professor of Clinical Medicine.
Staff Surgeon F. S. B. F. DE CHAUMONT, M.D., Assistant Professor of Hygiene.

At a meeting of the above Committee, held on the 2nd July, 1870, at the Office of the Army Medical Department, it was unanimously resolved that Inspector-General of Hospitals G. S. Beatson, C.B., M.D., Honorary Physician to the Queen, be elected a member of the Committee in the room of the late Sir J. B. Gibson, K.C.B., and that the following be added to the Committee:—

Professor E. A. PARKES, M.D., F.R.S.
R. LAWSON, Esq., Inspector-General of Hospitals.
J. G. INGLIS, C.B., M.D., Deputy Inspector-General of Hospitals.
C. H. FASSON, M.D., Surgeon-Major.

It was unanimously resolved that the issue of 50*l.* and a gold medal, value 10*l.*, awarded to Assistant-Surgeon B. R. Myers, 1st Battalion Coldstream Guards, for the best Essay on "The Etiology and Prevalence of Diseases of the "Heart among Soldiers as compared with the Civil Population of those "countries in which they are called upon to serve, and the means of prevention or mitigation, due regard being had to the conditions in which the "Soldier is unavoidably placed." be sanctioned, and that the balance due to Messrs. Wyon be paid on the delivery of the medal.

The selection of a subject for the next competition was then discussed, when it was determined that a prize of 50*l.* and a gold medal value 10*l.* be offered for the best Essay, "On the Nature and Varieties of Destructive Lung "Disease included under the head of '*Pulmonary Consumption*,' as seen "among Soldiers, and the hygienic conditions under which they occur. To be "illustrated, as far as possible, by cases drawn from the personal observation "of the author."

The essay to be legibly and clearly written, superscribed with a brief motto, and accompanied by a sealed envelope, similarly superscribed, containing the name and address of the author.

Essays to be despatched to the President, Alexander Memorial Fund Committee, Army Medical Department, 6, Whitehall-yard, on or before the 31st December, 1872.

The competition to be limited to Executive Medical Officers of the Army on full pay.

The relative merits of the essays to be determined by Assessors to be selected by the Committee.

The prize to be awarded to the best essay offered without reference to the number of competitors, provided the writer has complied with the prescribed conditions.

APPENDIX No. XXVIII.

ARMY MEDICAL SCHOOL, NETLEY.

THE 19th Session, or Winter Session, of 1869–70, was attended by 39 candidates for the Indian Medical Service. No candidates for commissions in the British Medical Service were present.

The order of precedence in which the candidates were eventually arranged to be gazetted was fixed in accordance with the combined results of the preliminary examination at Chelsea, and the final examination at Netley. The order of precedence, together with the number of marks gained by each candidate, is shown in the List which follows.

The questions put at the two examinations, at Chelsea and Netley, are also given.

The Herbert Prize was awarded to Mr. O. T. Duke.

In addition to the candidates for commissions above-mentioned, 1 Surgeon-Major, 4 Surgeons, and 20 Assistant Surgeons of Her Majesty's British Service attended the Army Medical School during this session.

Seventeen of the Assistant Surgeons went through their examination for promotion at the close of the session. The examination, written and practical, was the same as is noted hereafter, under the head of "Netley Examination."

NINETEENTH SESSION, WINTER, 1869–70.

Combined Results of the Chelsea Examination in August 1869, and of the Netley Examination in February 1870.

Order of Merit, as finally settled.	Names, arranged in Order of Merit for both Examinations.	Total Number of Marks (Maximum, 6,900).	Order of Merit, as finally settled.	Names, arranged in Order of Merit for both Examinations.	Total Number of Marks (Maximum, 6,900).
1	Duke, O. T. ..	5,518	21	Kelly, A. H. ..	3,575
2	Nicholson, F. C..	5,440	22	Meadows, C. J. W.	3,555
3	Gunn, J. T. ..	5,005	23	Waters, G. ..	3,478
4	Hendley, T. H. ..	4,915	24	Keefer, W. N. ..	3,460
5	Gregg, W. H. ..	4,600	25	Deane, A. ..	3,392
6	Seaman, A. B. ..	4,508	26	Murphy, P. ..	3,365
7	Ghose, F. C. ..	4,451	27	Jones, F... ..	3,323
8	Smyth, F. A. ..	4,370	28	Murray, W. F. ..	3,196
9	Sinclair, D. ..	4,250	29	Carswell, J. S. ..	3,166
10	Salaman, S. M. ..	4,230	30	McConaghy, W...	3,046
11	Boyd, H... ..	4,025	31	Hughes, A. H. ..	3,027
12	Lloyd, J... ..	3,975	32	Wall, R. M. ..	2,940
13	Barker, F. C. ..	3,913	33	North, J... ..	2,770
14	Courtney, W. M..	3,860	34	Fawcett, E. ..	2,703
15	Ruttledge, E. B..	3,736	35	Paterson, F. R. ..	2,697
16	Robinson, T. ..	3,715	36	Hastings, W. ..	2,683
17	Caldecott, R. ..	3,694	37	Spencer, T. C. H..	2,679
18	Martin, D. N. ..	3,648	38	Hall, H. G. ..	2,435
19	Strahan, A. B. ..	3,612	39	Jones, H. J. ..	2,431
20	Roe, W. A. C. ..	3,607			

CHELSEA EXAMINATION, AUGUST 1869.

Anatomy and Physiology.

1. Describe the structure and relations of the membranous portion of the urethra; giving the dissection requisite to expose it, and the parts in immediate relation with it.

2. Enumerate and classify the various forms of articulation which occur in the human body; giving an instance of each kind, and describing the different sorts of movement of which each is capable.

3. State the muscular and other parts which it is necessary to remove, in order to fully expose the arteries, superficial and deep on the front of the fore-arm, and the deep palmar arch in the hand.

4. Contrast and compare the nerves supplying the foot with those of the hand, and give the dissection required to expose the external plantar nerve.

3. Describe the optical arrangements of the human eye, the means by which spherical and chromatic aberration is corrected, and the most probable mode by which vision is adjusted to near and distant objects.

Surgery.

1. Describe the symptoms and treatment in a case of ruptured intestine, the result of external violence without external wound. What pathological conditions would be observed after death.

2. What are the causes of retention of urine—

a. in childhood?
b. in middle life?
c. in old age?

Describe the morbid changes usually observed in the urinary organs in cases of long-standing strictures of the urethra.

3. Describe the symptoms in a case of Psoas abscess, the treatment to be pursued, and the probable result. What post-mortem conditions would be observed in a fatal case?

4. A man has been wounded by a bayonet in the right side of the chest, between the fifth and sixth ribs, which has punctured the pleura. Describe the symptoms which would probably occur in such a case during its progress towards recovery. How would you treat the patient?

5. Describe a case of senile gangrene, and the treatment to be pursued. What pathological changes would be found in the arterial system?

6. Describe the symptoms and progress of a case of syphilitic iritis unchecked by treatment. How would you treat a case in the first onset of the attack?

Medicine.

1. Enumerate the chief causes of convulsions in adults and children. Then give the symptoms of a convulsive attack in an adult proceeding from kidney disease, and state particularly how the diagnosis is to be made, and what treatment you would adopt.

2. A man, aged 54, who had been intemperate, and 13 years previously had suffered from rheumatic fever, was admitted into hospital with great anasarca and ascites, and with moderate hæmoptysis, which last symptom had come on three days before admission. A disease of the heart was diagnosed. What might have been the heart-disease? Trace up the history according to your explanation, give the signs which would exist, and state in what condition the lungs, liver, and kidnies probably were.

3. Give the symptoms, causes, and treatment, of stricture of the cardiac and of the pyloric orifices of the stomach.

4. What are the chief morbid appearances found in the kidney, or in its

pelvis, on post-mortem examination. Mention briefly the prominent symptoms connected with each condition.

5. For what reasons, and in what manner, would you induce premature labour?

6. What are the uses and abuses of mercury? Enumerate the chief preparations and the principal modes of using it internally and externally.

Natural History and Physics.

[Candidates are requested not to attempt more than TWELVE of these questions.]

1. Zoology.

1. What are the dental and other characters of the class Ruminantia?

2. Give the principal characters of the genus Helix.

3. What is meant by Hybernation? In what animals does it occur, and what functional conditions do they present during it?

4. What are the peculiarities in the reproductive process in the genus Aphis?

5. Define the terms Species, Genus, Family, Organ, Function, Instinct.

6. Describe the process of Fecundation in fishes.

2. Botany.

7. What is Liber? In what part of the plant does it occur?

8. Describe the process of respiration in plants.

9. What are the principal distinctive characters of *Lichens*, *Algæ*, and Fungi?

10. What are the characters of the natural order Gramineæ?

11. What is the nature of the rotation of Crops, and what are the physiological grounds on which it is founded?

12. Enumerate the principal Vegetable Anthelmintics, giving in each case the scientific name, natural order, and native country, and the part of the plant used.

3. Physics, &c.

13. What is meant by specific gravity? How is it ascertained? Arrange the following substances in the order of their densities: copper, gold, mercury, lead, silver, chlorine, hydrogen, oxyen.

14. Explain the structure of an electrical machine and a galvanic battery.

15. What differences exist in the climates of the East Coast of North America and the West Coast of Europe? and how are they to be explained?

16. What are the principal ores of iron in Britain? Explain the process of the extraction of the metal, and the difference between cast-iron, malleable iron, and steel.

17. What are the chemical and physical characters of Ammonia? and what are the principal sources from which it is obtained?

18. What is the microscopical structure of chalk? and what is the generally received explanation of its formation?

NETLEY EXAMINATION, FEBRUARY 1870.

Held at the close of the 19th Session of the Army Medical School.

A. Written Examination.

I. Military Hygiene.

1. In what way is the soil supposed to be concerned in the production of typhoid fever and cholera. What truth is there in Pettenkofer's opinions on this point? What other diseases are caused or influenced by the conditions of the soil?

2. How may water become impure, and what are the chief points to be attended to in examining into the water supply of a town or of a body of men?

3. What are the objections which have been raised to the removal of excreta by water, and how far are they valid?

4. State generally the diseases causing mortality in Bengal, in Europeans and Sepoys.

What are the chief preventive measures for cholera and insolation?

II. Pathology.

1. *a.* State the composition of the iodine test ussd for the demonstration of lardaceous degeneration.

b. The bodies of six soldiers were inspected during the past session, in each of which lardaceous degeneration was demonstrated in the liver, the spleen, the kidneys, or the intestines (in one or in all of these parts in the same subject).

Mention generally the other morbid conditions associated with the degeneration during life or seen after death; and mention especially the one morbid condition which was common to all the cases.

2. What is a distoma? What are the organs or parts of the human body in which this parasite is found? in what form or stage of development does it exist in these organs or parts; and how does it betray its presence during life? In what geographical districts does the parasite prevail?

3. The dead bodies of two soldiers were examined during the past session, in each of which abscess of the liver was found. The history of each case was as follows:—

(*a*). *Case* 21. Coporal W. L—, age 34, had 14½ years' service, and 132 days' illness previous to death. The prominent symptoms of his illness were bronchitis with valvular disease of the heart, for which he was invalided from India to Netley, where he arrived in a very weakly condition on December 24th, 1869. The præcordial region was prominent, the impulse of heart very distinct and undulatory, visible in the epigastric region. Area of dulness increased. Bruit audible near left nipple, also over the sternum. Pulse 108 to 112, fuller and stronger at the right than at the left wrist. Respiration rapid with dyspnœa. Infra-clavicular regions flattened. Crepitation distinct beneath right clavicle. Rough respiration in the left lung. Expectoration of green sputa, mixed with frothy mucus. No hæmoptysis. There was dysphagia. Bowels relaxed, the motions of a bright yellow colour. Left pupil contracted compared with the right; and not sensitive to the light. Pain in the præcordial region, none in the back. Death by exhaustion. No history of syphilis; but a cicatrix in left groin.

Give an account of the morbid appearances:—

1. In the chest; 2. in the liver; 3. in cœcum and colon.

(*b*). *Case* 22. Driver George W—, aged 25, had 6½ years' service, and two or three months' illness previous to death. He was invalided from India for persistent headache following "Insolatio," but which had so far ceased that he was able to assist in coaling the ship at Aden during the voyage home. Here he is said to have "taken cold"; and, when near Portsmouth, after sleeping near an "open port," slightly clothed at the time, he was seized with a sudden

severe pain in the right hypochondriac region. The pain extended to the right shoulder, and was so severe as almost to prevent breathing. He arrived at Netley, November 9th, 1869, extremely weak. There was increase of hepatic dulness; fulness of the right lower intercostal spaces, and slight cough; with decubitus either on the back or on the left side. November 15th (six days after admission) there was a "rigor," and the following day crepitus was heard over the base of the right lung anteriorly and posteriorly. Right side of the chest measured one inch more than the left. November 19th, pains severe in right shoulder. Increase of pulse and of temperature (101° to 103°) persistent to the end. November 29th, after a violent fit of coughing, a pint and a-half of viscid, frothy, thick mucus or pus was expectorated. December 25th diarrhœa set in with great pain—purging every few minutes, varying quantities of chocolate-coloured stools, liquid with scybala and blood—having a dysenteric odour.—January 8th, 1870, death by exhaustion.

Give an account of the morbid appearances:—

1. In *right* cavity of chest and in *right* lung.
2. In the small and large intestines.
3. In the liver.

Describe especially the distinguishing characters between the morbid appearances seen in the *livers* of the two cases.

III.—Military Surgery.

1. What circumstances may lead to the absence of:—

(*a*) haemoptysis,
(*b*) dyspnœa,
(*c*) emphysema,
(*d*) external hæmorrhage,

notwithstanding that a patient has been shot through the chest and lung?

2. What are the most frequent proximate causes, and what are the most frequent remote causes, of death after gunshot wounds of lungs?

3. Describe the general plan of treatment of gunshot wounds of lungs?

4. Explain the principles on which a convex lens can be made use of for determining whether an eye be emmetropic, myopic, or hypermetropic, when the distance of the principal focus is known.

Furnish an example illustrative of each quality of vision, the lens employed having a principal focus distant 8 inches from its centre.

IV.—Military Medicine.

1. What are the diseases of the heart and great vessels commonly observed in the Army? Describe them in succession, with the causes that appear to give rise to them, explaining the *modus operandi* of such causes clearly.

2. What are the symptoms, general and local, leading to the diagnosis of aneurism of:—

(*a*) the thoracic,
(*b*) the abdominal aorta,

with a brief explanation of the symptoms as they are named.

3. Describe the true habitat of yellow fever.

Show how race, age, sex, temperature, and altitude above the level of the sea affect the propagation of the disease.

Name the disease with which it is most apt to be confounded, and give the points for diagnosis in detail.

In what sense do you understand yellow fever to be contagious?

How is it usually introduced into a place? Give any examples you may remember.

Once introduced into any locality, contrast its behaviour with that of cholera in like circumstances.

Describe—(*a*) the general; (*b*) the most characteristic symptoms, including pulse-rate and temperature. Are the two always in accord in this disease?

What is the nature of black vomit?

Name the varieties of yellow fever which have been described.

Supposing the disease introduced into a garrison, what advice would you give to the officer in command to insure as far as possible the safety of the troops?

How would you treat the disease?

B.—Practical Examination.

Pathology.

1. Examine the portions of tissue placed in the dishes. State of what organ each is a part, and describe its morbid condition.

2. In the preparations numbered 1, 2, 3, 4, 5, and 6, define anatomically what parts are shown, and describe the lesion or lesions which are illustrated in each.

3. Determine the magnifying power of any one of the microscopes, and append the scale used.

4. Describe and name generally what you see in the fluid contained in the test tubes examined under the highest power.

5. Name each of the preparations placed under the microscopes on the table.

Military Hygiene.

1. Examine the sample of water before you—as much as can be done in the time.

2. Determine in the sample of milk before you, the amount of lactine, &c., and state your opinion about it.

3. Examine the contents of the packet before you chemically and microscopically.

4. Read the meteorological instruments before you, and apply the necessary corrections.

Military Medicine and Surgery.

Examine the case of

Write concisely a history of the case,—your diagnosis, prognosis, the probable effects of treatment, and the influence of the disease (or injury) on the man's fitness to service as a soldier.

The 20th Session of the Army Medical School, held during the Summer of 1870, was attended by 10 candidates for commissions in the Indian Medical Service. There were again no candidates for the British Service.

The order of precedence, determined by the combined results of the examinations at Chelsea and Netley, and the total number of marks gained by each candidate in the two examinations, are shown in the list which follows. The Herbert Prize was gained by Mr. J. F. P. McConnell.

One Surgeon-Major, 10 Surgeons, and 19 Assistant Surgeons of Her Majesty's British Service attended this session. One Surgeon-Major and 2 Surgeons of Her Majesty's Indian Service also attended.

Fifteen of the Assistant Surgeons underwent their examination for promotion at the end of the session.

TWENTIETH SESSION, SUMMER, 1870.

Combined Results of the Chelsea Examination in February, and at Netley in August, 1870.

Order of Merit, as finally settled.	Names, arranged in Order of Merit for both Examinations.	Total Number of Marks (Maximum, 6,900).	Order of Merit, as finally settled.	Names, arranged in Order of Merit for both Examinations.	Total Number of Marks (Maximum, 6,900).
1	M'Connell, J. F. P.	5,855	6	Sibthorp, C. ..	4,119
2	O'Brien, J. ..	5,215	7	Laing, J. A. ..	4,065
3	M'Donnell, J. O'M.	4,878	8	Cook, H. D. ..	3,988
4	Reid, J.	4,683	9	Peterson, R. A. ..	3,941
5	Mackenzie, G. P. .	4,418	10	Weir, T. S. ..	3,681

[The questions at the two examinattons, at Chelsea and Netley, now follow.]

CHELSEA EXAMINATION, FEBRUARY 1870.

ANATOMY AND PHYSIOLOGY.

1. The Gastrocnemius and Soleus having been removed, describe the parts then brought into view, from the upper border of the *popliteus* to the heel. Give also the relative positions of the tendons, vessels, and nerves passing behind either malleolus.

2. Enumerate the muscles connected with the thumb, giving their origins, and insertions, and the precise relative position of those constituting the ball of the thumb, and their relations to blood vessels, nerves, and tendons.

3. Give the origin and insertion of the followin muscles, and state the nerves by which they are respectively supplied.

1. Glutæus minimus.
2. Tensor vaginæ femoris.
3. The gracilis.
4. External oblique.
5. Flexer longus pollicis pedis.
6. Middle constrictor of the pharynx.

4. Describe the structure, mode of formation, and of connection with the uterus, of the placenta, and the way in which the fœtal circulation is carried on.

5. State the different modes in which ossification takes place, giving an instance of each. Describe also the course followed in the ossification of the humerus, at various periods from its commencement to its completion.

6 Describe the minute structure of the *cochlea*, and the parts contained in it.

SURGERY.

1. What are the conditions, local and general, commonly observed in a case of acute necrosis of the tibia? Describe the usual results of such an attack, and the treatment to be pursued in its various stages.

2. Describe the symptoms of popliteal aneurism, and what treatment should be adopted for its arrest. Under what circumstances would amputation of the limb be requisite?

3. In a case of ununited fracture of the femur, of some few weeks' duration, what constitutional derangement would probably exist? and should constitutional measures fail to procure union, what local measures should be had recourse to?

4. Describe the symptoms by which cancer of the bladder in the male might be distinguished during life from other affections of that organ. What treatment would be desirable in such a case?

5. A man had a heavy wheel pass over the middle of his thigh. When seen some few hours after, the opinion given was that rupture of the femoral artery had taken place. Describe the symptoms which would be present to justify such an opinion, and what treatment should be adopted in such an accident.

6. Describe the symptoms of syphilitic rupia, and the treatment to be recommended for its relief.

Medicine.

1. What are the chief causes of palpitation of the heart? Give the various symptoms which would lead you to recognize each cause, and describe the treatment.

2. In what organs of the abdomen does cancer most usually occur? Describe cancer of the liver and of the stomach as seen after death, and give the symptoms during life.

3. What are the chief causes of intestinal hæmorrhage? Give the treatment.

4. What are the principal anatomical conditions of the kidneys causing albumen in the urine? Describe fully the symptoms usually included by writers under the term Uræmia.

5. What are the causes, symptoms, and modes of treatment, of displacements of the unimpregnated Uterus?

6. What are the chief therapeutical uses of Aconite, Belladonna, and Hyoscyamus? State the pharmacopœial preparation and doses of the two former substances, and the symptoms of poisoning of each.

Natural History and Physics.

1. Zoology.

1. What are the distinctive characters of the vertebral column in the different classes of vertebrata?

2. What are the principal modifications of the mouth in the different orders of insecta?

3. Describe the respiratory apparatus of reptilia and amphibia.

4. Give the principal characters of the class Aves, and mention some of its most abnormal members.

5. How do the teeth of Rodents, Ruminants, and Carnivores differ? What relation have these differences to the nature of the food in each case?

6. What is the area of distribution of the following mammals: lion, tiger, beaver, elephant?

2. Botany.

7. Describe the structure of the seed, and point out the differences between the seed of an exogen and an endogen.

8. Define the terms rhizome, pseudobulb, corm, tuber, bulb, and distinguish them from each other, and from the true root.

9. Give the characters of the natural order Solanaceæ, including Atropaceæ, and enumerate its principal useful products, giving in each case the part of the plant used.

10. To what natural order does the plant which yields quinine belong? Of what country is it a native, and where is it cultivated? How is quinine prepared?

11. Enumerate the principal vegetable poisons with the name and natural order of the plant yielding them, and the part of the plant in which the poison occurs.

12. What plants yield sugar? How is it prepared? What is its composition, and what its use in the economy of the plant?

3. Physics, &c.

13. What is iodine? Where does it occur in nature, and how is it prepared?

14. Give a sketch of the phenomena of sound.

15. Enumerate the principal forms of carbon, giving their physical characters. What is carbonic acid, and in what forms does it exist in nature?

16. In what regions of the earth are forests most abundant, and what is their influence on climate and health?

17. Define and illustrate the following terms: Combustion, Attraction, Gravitation, Radiation, Refraction, Capillarity, Crystal, Amorphous, Colloid.

18. Give a sketch of the tertiary formations in England.

NETLEY EXAMINATION, AUGUST 1870.

Held at the close of the 20th Session of the Army Medical School.

A. Written Examination.

I.—Pathology.

1. Describe the morbid anatomy of a liver contracted or reduced to a minimum in bulk from *cirrhosis*; also the morbid anatomy of a liver reduced by the *cicatricial contractions of syphilitic lesions*. Compare the two morbid conditions so as to bring out the characteristic differences and similarities between them.

2. Describe the anatomical characters of—

1. Typhoid.
2. Dysenteric.
3. Scorbutic lesions of the intestines.

3. Of the twenty post-mortem examinations conducted this session, name the various lesions of the liver you have seen, and describe their distinctive characters as well as the conditions under which they were brought about.

II.—Military Hygiene.

1. What are the opinions of Professor von Pettenkofer with regard to epidemic outbreaks of cholera and typhoid fever, and how far do you think he is correct in entirely denying the agency of impure water in either case?

2. What are the chief diseases causing mortality among Europeans in India? What measures would you propose in order to lessen the prevalence of these diseases?

3. In the case of an army taking the field in Europe, what would you recommend in respect of food and clothing, and what are the chief points to be attended to in marches and encampments?

III.—Military Surgery.

1. Give concisely an account of the articles comprising the regulated equipment for British field hospitals in time of war.

2. Gunshot wounds of the knee-joint—

A. Explain the circumstances which render gunshot wounds more hazardous than incised or stabbing wounds of the knee-joint.

B. State the recorded results of gunshot wounds of the knee-joint during the War of the Rebellion in the United States, and during the Bohemian War of 1866. Compare these results with the experience gained by English Surgeons during the wars on the Continent between 1808 and 1815, and also during the Crimean War.

C. What have been the results in recent wars of treating gunshot wounds of the knee-joint—

(*a*) By freely incising the joint,
(*b*) By excising the joint,
(*c*) By amputation above the joint, and
(*d*) By conservative practice?

3. A patient with defective vision is submitted for your opinion and you report that, after examination with the 10-inch convex spectacles, you find he has myopia = $\frac{1}{15}$ and amblyopia. Explain the steps by which you arrive at this conclusion.

IV.—Military Medicine.

1. A. B., a soldier, 30 years of age, has 10 years' service, most of it in India, presents the following symptoms:—

Is emaciated and anæmic, with a worn and anxious expression.
Has frequent calls to stool, the motions being fluid, bloody, and very offensive.
There is abdominal tenderness which, although general, is more marked along the course of the great intestine than elsewhere.
The right hypochondrium is enlarged.
The 6th, 7th, and 8th ribs from their angles to their sternal extremities are prominent, and careful measurement shows that the right side, at the part above indicated, is 2¼ inches larger than the left.
There is a sense of fulness, and some tenderness on pressure all over the right hypochondrium, and the liver extends downwards 3½ inches below the false ribs.
The patient complains also of a dull aching sensation in the right shoulder. The decubitus is on the back, occasionally on the right, never on the left side.
Pulse 120, rising at night to 130.
Temperature in the morning never below 99°, rising in the evening to 101°, 102°, and 103°. Respiration 25, at night often 28.
The patient sweats profusely at night, and during the day when he sleeps.
His appetite is bad, his urine normal in quantity, but high-coloured and loaded with urates.

Diagnose this case:—Explain the symptoms in detail, giving their diagnostic and prognostic significance, and explain fully how you would treat this patient.

2. What ill-effects can reasonably be traced to dress and accoutrements in soldiers at all times, more particularly when they are made to undergo much fatigue in hot weather?

(*a*) How are such effects, as far as possible, to be obviated?
(*b*) How to be treated when they occur?

3. Give the therapeutic uses, doses, and modes of administration of the following drugs in tropical medicine:—

1. Quinine.
2. Arsenic.
3. Aconite.
4. Ipecacuanha.

B. Practical Examination.

Pathology.

1. Examine the portions of tissue placed in the dishes. State of what organ each is a part, and describe its morbid condition.

2. In the preparations numbered 1, 2, 3, 4, 5, and 6, define anatomically what parts are shown, and describe the lesion or lesions which are illustrated in each.

3. Determine the magnifying power of any one of the microscopes, and append the scale used.

4. Describe and name generally what you see in the fluid contained in the test tubes, examined under the highest power.

5. Name each of the preparations placed under the microscopes on the table.

Military Hygiene.

1. Examine the sample of water before you, as much as can be done in the time.

2. Examine the contents of the packet before you chemically and microscopically.

3. Read the meteorological instruments before you, and apply the necessary corrections.

Military Medicine and Surgery.

Examine the case of—

Write concisely a history of the case,—your diagnosis, prognosis, the probable effects of treatment, and the influence of the disease (or injury) on the man's fitness to service as a soldier.

The questions put to the Assistant Surgeons in their examination for promotion were the same as the foregoing, both written and practical, with the addition of the following question in surgery and surgical anatomy :—

Shoulder-joint.

(*a*) Describe the operation of excising the shoulder-joint by single straight incision in the ordinary method.

[Memo. Each step of the operation must be distinctly described. The several structures divided are to be named.]

(*b*) What muscles and other structures divided by the ordinary method are left undivided, when the same operation is performed subperiosteally?

(*c*) Name the anatomical structures not cut in excision of the joint, which would be divided if amputation at the shoulder-joint were performed instead.

APPENDIX No. XXIX.

CIRCULARS, GENERAL ORDERS, &c.

HAVING REFERENCE TO THE MEDICAL DEPARTMENT FROM 1ST MARCH, 1870, TO 1ST JANUARY, 1871.

1st. WAR OFFICE CIRCULARS.

Pay Lists for Staff and Departmental Officers.

Clause 36. 1st March, 1870.

A new form of account (W. O. Form 26) for the pay and allowances of Staff and Departmental Officers has been approved, and copies of the same have been circulated. The new form will be brought into use both at Home and Abroad on the 1st April next.

Advance Pay to Officers on Embarkation for India.

Clause 50. 1st May, 1870.

It is hereby notified, with reference to Clause 159, Army Circulars, 1869, that the period for which pay may be advanced to *Officers* proceeding overland to India continues to be for 40 days only.

Medical Aid for Women in Childbirth.

Clause 61.

1. In the event of the Midwife referred to in Clause 2 of War Office Circular 849, requiring assistance in any case of danger, it will be the duty of the Military Medical Officer, provided there be one at the station, to render the necessary aid.

2. War Office Circular 906 is hereby cancelled.

Disposal of Useless Books, &c.

Clause 62.

1. It having been decided that waste paper, useless books, &c., shall be forwarded by the Control Department direct to the Stationery Office, the following regulations are issued in substitution for those contained in Clause 22, Army Circulars, 1870, which is hereby cancelled.

2. Useless books and documents (including printed forms) will not be allowed to accumulate. Should any great accumulation at present exist in any Regimental or Staff Military Office, steps will immediately be taken for a clearance being made in the manner laid down in these Regulations.

3. Before books or documents are condemned as useless, the Officer at the head of each office will forward to the War Office through the local Controller, a full list thereof, on W. O. Form 647, showing the following particulars:—

1. The description of the books or documents,
2. The periods to which they apply,
3. The reasons in each instance for the books or documents being considered no longer necessary.

The Secretary of State for War will then decide as to the retention or destruction of the books or documents in question.

4. All books and documents condemned as useless, as also old paper, and other worn-out articles of stationery (excepting old bottles and pens), both in Staff and Departmental Offices, will from time to time, under orders from the local Controller, be delivered over to the Control Department by the several Heads of Offices.

5. The Control Department will, however, on no account take charge of condemned books, documents, &c., until a notification is received from the War Office, that the condemnation has been authorized by the Secretary of State for War.

6. In order that the expense of forwarding useless books, and documents, from stations abroad, may be diminished as much as possible, local Controllers will, after bringing them on charge by weight, send them to this country in Her Majesty's ships, or in any other way by which cost will not be incurred for freight.

7. At Home stations, books, paper, and all such articles will be brought on charge by weight, and kept in store by the local Controllers until the accumulation amounts to one cwt.; when they will be forwarded to the Stationery Office through Messrs. Pickford's agents, unless any cheaper mode of conveyance shall be available.

8. The cases and packages, whether sent from Home or Foreign stations, will be addressed to the Controller of Her Majesty's Stationery Office, London, and marked "waste paper," the words by "goods train" being added in case of railway transit. At the time the cases or packages are despatched, an invoice of the contents will be forwarded by post to the Controller of the Stationery Office.

Holidays in the Departments.

Clause 87. 1st June, 1870.

With reference to Art. 681 of the Royal Warrant of 3rd February, 1866, the following instructions regarding holidays to be observed in the various departments, are hereby promulgated, viz.:—

Good Friday, Christmas Day, Coronation Day, and the day fixed in each year for the anniversary of the Sovereign's Birthday, will be kept as holidays in the various departments. If Christmas Day fall on a Sunday the holiday may be observed on the following Monday. Wages will be issued on these days to all persons permanently employed by the department, and persons temporarily employed after having served one month are entitled to this indulgence. If, however, work shall be required to be done on any holiday, another day will be afterwards allowed in lieu of such holiday, should the service permit.

Training of Army Midwives.

Clause 110. 1st July, 1870.

Regulations for the Training of Army Midwives are issued with the present Army Circular, for the information of Medical Officers and others concerned.

THE TRAINING OF ARMY MIDWIVES.

General Regulations.

1. If possible such women only as are without family should be selected for instruction as Army Midwives, and a preference should be given to such as possess a fair elementary education.

2. Practical instruction at the patient's bedside, under the personal superintendence of the Medical Officer, should be conveyed as frequently as practicable to the women attending the class, to illustrate the principles and directions laid down in the lectures.

3. A certificate of proficiency should be given to each woman who has regularly attended a full course of lectures, and has shown by her replies at a final examination that she is quite conversant with the subjects taught. But no woman must be admitted to such final examination until she has attended at least 20 cases of labour to the satisfaction of the Medical Officer.

4. At convenient hours, and not oftener than three times a week, the Medical Officer will hold a class for the instruction of the women in the form of lecture and oral examination, illustrated, when practicable, by models and diagrams.

5. The length of such theoretical course of instruction should, as a general rule, be limited to three months, including 36 lectures. Should a woman after this fail to qualify as laid down in paragraph 3, she should be, at the option of the Medical Officer, remitted to a further course of study, or otherwise.

6. An outline of the course of instruction which midwives should undergo is appended.

At some stations it will probably not be found possible to give full instruction in all the details of this outline, but an attempt should be made to approach to it as nearly as possible.

Outline of Instruction by Lectures.

1. A simple and general idea of the human skeleton.

2. A more particular description of the female pelvis, its bones, measurements, axes, natural and deformed states.

3. A simple account of the female sexual organs, and the anatomy and physiology of the vagina, uterus, ovaries, urethra, rectum, &c., with their relation to each other.

4. A simple account of the development of the fœtus, its growth, nutrition, membranes, &c., with remarks on the placenta and umbilical cord.

5. Some account of the impregnated uterus; the signs of pregnancy; the duration of utero-gestation; death of the fœtus in utero, &c.

6. Abortion and premature labour, the signs of their coming on, means of prevention.

7. Full instructions on the mechanism of labour.

8. Instructions as to presentations in labour.

To distinguish natural from mal-presentations.

9. Natural labour, its three stages, and their average duration; application of knowledge acquired under former heads; condition of the parts at each stage; on undue interference; the delivery; parts that may be injured in delivery; attention to bladder and rectum; management of the cord and placenta; attention to compresses, bandages, bedding, comfort of patient generally.

10. Preternatural labours, distinguishing marks of each variety. Deficient and excessive uterine action; rigidity of the parts, tumours, accumulations in the various viscera; deformities; affections of the fœtal membranes, of the fœtus itself; plural births, &c.

11. Complex labours; cord presentations; retained placenta; hæmorrhage; convulsions; rupture of different parts, &c.

12. Conditions after birth; syncope; flooding; abnormal uterine contraction; inversion of uterus; the lochia; puerperal conditions, fever, mania, &c.; infection; cleanliness; recumbent posture and its term; proper food; as to stimulants, &c.

13. The child; attention to it; asphyxia; deformities; occlusions; treatment of the cord; first food; popular fallacies; the mother's breast, nipples, milk, &c.

General Principles of Sick Nursing.

It being of great importance that the women under training should have a clear and correct conception of the general principles of sick nursing, a few lectures should be devoted to this purpose. The instructions here appended should be amplified and illustrated by the Medical Officer as occasions offer.

1. *The Sick Room.*—It should be kept scrupulously clean, but excessive sweeping, rubbing, and other movements creating noise and raising dust should be avoided. The least possible amount of furniture and hangings should be retained in the room, as tending to diminish cubic space, impair ventilation, and attract dust, infectious emanations, &c. Means should be taken to secure a free ventilation, and as much sunlight as possible, without actually exposing the patient to draughts or to glaring light directly on the face. Care should be taken to regulate the amount of fire in the room, so that the temperature should remain at about 60°. It is useful to have a thermometer in the room, hung away from the fire and near the patient, to show this. It should also be remembered that gas-burning and other artificial lighting tend to vitiate the air, and heat the room, and they are to be employed only sparingly. In most conditions of weather, in most rooms, it will be possible and proper to open the windows freely from the top for a reasonable time, or times, every day. Patients are not more likely to catch cold when properly covered up in bed, than when moving about dressed. A general cheerfulness of arrangement, or even ornamentation, when practicable, should not be neglected in a sick room, and the general feeling in the room should be one of order, quietness, and repose. The fumigation and disinfection of a sick room should only be carried out under the direction of the Medical Officer, but the immediate removal of all discharges from the sick, and the thorough purification of the vessels before replacing them should never be neglected. The same rules apply to all dishes which have been used for food and drinks. If possible, cooking should not be

carried on in a sick room, although drinks or other articles may be warmed or kept warm, when it is otherwise necessary to have a fire. Access to a sufficient supply of hot and cold water is very desirable.

2. *The care of the Patient.*—There are very few cases indeed in which it is not possible and indeed imperative to sponge daily with tepid water, at least, the hands and face of the sick person. At longer intervals there is seldom objection, and nearly always much advantage from this refreshing process being extended to the other parts of the body, care being taken not to wet the bedding. In feverish cases, or where the patient craves it, the lips may be safely moistened at short intervals with cold water, or very dilute vinegar and water, and a cloth or towel wrung out of the same may be passed over the face or laid on the forehead with refreshing effect. The bed and bedding should be scrupulously clean, and changed as often as necessary, spread evenly, and so as to be neither too hard or too soft, and to be without crease. The head and shoulders are better somewhat raised by an elastic feather pillow, especially during the day.

Examination should be frequently made as to warmth of the extremities, the soiling of the bedclothes, the appearances of the skin as to eruption, abrasion, or threatened bedsore. The feelings and craving of the patients are generally well worthy of attention, and probably of gratification. The movement of a hand or an eye should suffice often as a sign to a watchful attendant to spare the fatigue of speech. The temperature of the patient is often of moment to register, and the small thermometer made for the purpose placed in the armpit or under the tongue becomes soon easy to use, and gives valuable information to the Medical Officer at his next visit. The preparation and administration of different kinds of food and drinks can only be learned practically; but points to be remembered are, simplicity of preparation, attention to the Medical Officer's directions, and to the patient's cravings, care that they are neither too hot nor too cold, not too frequently forced down, not too long delayed, and not neglected at night, and especially towards early morning. The administration of medicines by measurement and otherwise, the application of blisters, plasters, ointments, washes, and the like, the preparation and uses of poultices, injections, fomentations, baths, &c., must all be carefully studied, and the Medical Officer's directions as to them on all points faithfully observed. On no account must the nurse take upon herself to administer stimulants to parturient women, or others, without instructions, nor interpose with fanciful remedies in any case.

The sick nurse should be *simply* dressed, so that she may move about without noise or disturbance of furniture. She should be cheerful without being talkative, gentle and hopeful in demeanour, and never harsh or abrupt even in gesture. She must not introduce frequent visitors or gossips to the sick room, nor should she frequently leave it for any unnecessary purpose. She should have her pencil and bit of paper to jot down directions from the Medical Officer, and minute information as to symptoms, progress, &c., for him. She should study to know when it is absolutely necessary to call in the Medical Officer, and arrange beforehand as to some means of conveniently getting access to him.

T. G. LOGAN, *Director-General.*

Army Medical Department,
July, 1870.

Medical Examination of Recruits.

Clause 111. 1st July, 1870.

Instructions for the Medical Examination of Recruits are issued with the present Army Circular, for the information and guidance of Medical Officers, and Civilian Medical Practitioners.

INSTRUCTIONS FOR THE MEDICAL EXAMINATION OF RECRUITS FOR THE ARMY.

The following Instructions, for the guidance of Medical Officers and Civilian Medical Practitioners in the Inspection of Recruits for the Army, will be substituted for those hitherto in use.

In the Inspection of Recruits, Examining Surgeons must be guided by their judgment and experience in rejecting men who do not possess the physical capacity requisite for the endurance of the toil, hardships, and exposure, incidental to military life.

The principal points to be attended to are:—

That the recruit is sufficiently intelligent.
That his vision is sufficiently good to enable him to see clearly with either eye at the required distance.
That his hearing is distinct.
That his speech is without impediment.
That he has no glandular swellings or marks of scrofula.
That his chest is capacious and well formed, and that the soundness of his heart and lungs has been stethoscopically ascertained.
That he is not ruptured.
That the limbs are well formed and fully developed.
That there is free and perfect motion of all the joints.
That the feet and toes are well formed.

Grounds of Rejection.

Men presenting any of the following conditions should be rejected:—scrofula; phthisis; syphilis; impaired constitution; defective intelligence; defects of vision, voice, or hearing; hernia; hæmorrhoids; varicose veins beyond a limited extent; inveterate cutaneous disease; chronic ulcers; traces of corporal punishment, or evidence of having been marked with the letters D. or B. C.; contracted or deformed chest; abnormal curvature of spine; or any other disease or physical defect calculated to unfit them for the duties of a soldier.

The following Course of Examination is recommended:—

NOTE.—When not required to approach the recruit for special objects, the surgeon should always take his place at a distance of about six feet from him. The recruit should be placed so that the light may fall upon him.

General Examination of the Recruit.

The recruit being wholly undressed, the following directions are given *seriatim*:—

1. Walk up and down the room smartly two or three times.
2. Hop across the room on the right foot.
3. Back again on the right foot.
4. Hop across the room on the left foot.
5. Back again on the left foot.

(*The hops should be short and upon the toes.*)

6. The recruit is halted, standing upright, with his arms extended above his head, while the surgeon walks slowly round him, carefully inspecting the whole surface of his body.

Remarks.—This completes the general examination. The objects to be observed and noted in this part are the following:—the existence of any obvious defects in physical constitution; the formation and development of the limbs; the power of motion in joints, especially in the feet and hips; flatness of the feet; formation of the toes; skin disease; varicose veins; cicatrices or ulcers; marks of the letter D. or letters B. C.; and any special marks from congenital or accidental causes. If any obviously disabling defects are noticed in the general examination, it is of course not necessary to proceed with the exercise further. If no such defects are found, the second part of the examination is at once proceeded with.

Special Examination.

A—The Trunk.

The trunk is examined from below upwards. The recruit stands with his arms extended above his head, the backs of the hands being in contact. The following is the order of inspection:—

1. The surgeon notes indications of venereal disease.
2. He examines the scrotum to ascertain if the testicles have descended and are normal, or if there be varicocele.
3. He inserts the point of his finger in the external abdominal ring of each side, and desires the recruit to cough two or three times, to ascertain if he be ruptured or liable to that condition.

4. He examines the abdominal walls and parietes of the chest.
5. He desires the recruit to "take in a full breath" several times, while he watches the action of the chest. Careful stethoscopic examination is made.
6. He examines the action of the heart, and notes its sounds.

Remarks.—This subdivision comprehends the inspection for venereal disease, disease of the testes, variocele, hernia, visceral disease of the abdomen and chest, and capacity of chest.

B—*The Lower Extremities and Back.*

The inspection is made from below upwards. The recruit first faces the surgeon, afterwards turns his back to him. The following are the directions given :—

1. Stand on one foot, put the other forward.
2. Bend the ankle joints and toes of each foot alternately, backwards and forwards.
3. Turn round. Kneel down on one knee.
4. Up again.
5. Down on the other knee.
6. Down on both knees, and up from that position with a simultaneous spring of both legs.
7. Separate the legs.
8. Touch the ground with the hands.

While the recruit performs these movements, the surgeon observes the action of the knee-joints, the condition of the perinæum, and of the spinal column.

Remarks.—This subdivision includes the inspection for defects of the toe, ankle, and knee-joints; for hæmorrhoids, prolapsus ani, fistula in perinæo, and spinal deformity.

C—*The Upper Extremities.*

This examination is made from below upwards. Time is saved by the surgeon himself acting as well as telling the recruit the movements he desires to be made. The following are the directions :—

1. Stretch out your arms with the palms of your hands upwards.
2. Bend the fingers backwards and forward.
3. Bend your thumbs across the palms of your hands.
4. Bend the fingers over your thumbs.
5. Bend your wrists backwards and forwards.
6. Bend the elbows.
7. Turn the backs of the hands upwards.
8. Swing your arms round at the shoulders.
9. The surgeon approaches the recruit and examines for marks of vaccination.

Remarks.—This comprehends the inspection for loss or defects of the fingers, thumbs, wrists, elbow and shoulder joints; power of rotating the forearm, and vaccination. If not vaccinated, the circumstance should be stated on the attestation paper.

D—*The Head and Neck.*

The examination is made from above downwards. The surgeon notes the intelligence, character of voice, and power of hearing of the recruit by his replies to the questions put to him. The following are the directions :—

1. Have you had any blows or cuts on the head? Are you subject to fits or giddiness? The surgeon at the same time examines the scalp.
2. The surgeon examines the ears.
3. Do you see well? The surgeon examines the eyes and eyelids.
4. He examines the nostrils.
5. He examines the mouth, palate, and fauces, and then tells the recruit to say, loudly, "Who comes there?"
6. He examines the neck.
7. The recruit is desired to dress himself.
8. The special tests for power and range of vision are applied to each eye as directed on the card of test dots furnished for that purpose.

Remarks.—This comprehends the inspection for injuries of the head; deafness; disease of the ears; defect of voice; polypus of nose; state of teeth; scrofulous ulceration; glandular enlargements; and defects of vision.

If the Inspecting Surgeon detect a recruit simulating disabilities, he is to attach a slip of paper to the man's attestation, containing a statement of the fact.

The signature of an Examining Surgeon to an attestation will be considered tantamount to a declaration that he personally examined the recruit in question according to these instructions, and that the man has no blemish or defect, except those noted on the attestation.

T. G. LOGAN,
Director-General.

Army Medical Department,
1st July, 1870.

Casualty Returns.

Clause 179. 1st November, 1870.

1. Officers Commanding regiments and depôts are informed that the returns of deaths, casualties, ages, and services, on W. O. Forms 196, 197, and 198, have been revised, and that they should be furnished to the Medical Officers in charge of their corps, as soon as possible after the 1st of January in each year.

2. Copies of these revised forms have been forwarded to Officers concerned, and should be used for the returns for the current year.

3. W. O. Circulars 605 and 737 are hereby cancelled.

N.B.—In the second line of the N.B., at the foot of the forms, the words "Clause 179, Army Circulars, 1870," will be substituted for "War Office Circular, No. 605, dated 7th July, 1860."

Medical Stores, Stationery, &c.

Clause 183.

1. Controllers, on receiving bills of lading containing entries of medical stores, books, stationery, or stores of any kind, consigned to them for transmission to Staff, Departmental, or Regimental Officers, will immediately notify the particulars, together with the name of the vessel, and the date of the bill of lading, to the Officers concerned.

2. W. O. Circular 666 is hereby cancelled.

Leave of Absence.—Staff and Departmental Officers.

Clause 1. 1st January, 1871.

The 61 days annual leave allowed by the Pay Warrant to Staff and Departmental Officers is intended to cover all leave of absence of every description. Each days' absence from duty, whether under local or superior authority, must therefore be duly recorded and shown on the form upon which the Officer's pay and allowances are drawn.

Lodging allowance to Regimental Officers during Leave.

Clause 3.

1. Regimental Officers in receipt of lodging allowance in lieu of barrack accommodation at home stations will, in future, if they retain their lodgings, be permitted to draw the allowance during such short periods of leave as do not, on the whole, exceed 30 days per annum.

2. Pending a revision of W. O. Form 1,112, claims to the allowance under this clause will be supported by certificates from Commanding Officers, showing the leave of absence taken by each Officer during the year from 1st April to 31st March.

2nd. GENERAL ORDERS.

Promotions.

G. O. 50. 18th May, 1870.

Promotion for Meritorious Service.

Her Majesty has been pleased to approve of the promotion of Assistant Surgeon James Jameson, M.D., 47th Regiment, to be a Staff Surgeon, in consideration of his highly meritorious service during the recent epidemic of yellow fever at Trinidad.

Medical (Examination of Seamen and Marines).

G. O. 51. 1st June, 1870.

Examination of Seamen and Marines.

In future, Army Medical Officers at Home, will examine and report upon seamen and marines, when requested to do so by the Director-General of the Medical Department of the Navy.

Embarkations (Quartermaster-General).

G. O. 55.

Medical Examination of Drafts.

It is hereby notified that paragraphs 1,181 and 1,205 of the "Queen's Regulations and Orders for the Army" apply equally to coast voyages and embarkations for foreign stations.

General Officers commanding at ports of embarkation will be so good as to issue such orders as will ensure the medical examination of every soldier, woman and child, prior to their embarkation.

Medical Officers (attached to Mounted Corps).

G. O. 78. 1st September, 1870.

Troop Horse for Medical Officer on line of march.

When a Staff Medical Officer is temporarily attached to a mounted corps for duty on the line of march, the Commanding Officer is to provide him with a troop horse.

A billet is also to be drawn for him as in the case of Regimental Officers.

Reports of Arrival.

G. O. 84.

Considerable expense and inconvenience having been caused by Officers, arriving from foreign stations, reporting their arrival in person at the Horse Guards, attention is directed to paragraph 1,315 of "The Queen's Regulations and Orders for the Army," which directs that all Officers, except General and Regimental Field Officers, are to report their arrival in writing.

Exchanges.

G. O. 89. 1st October, 1870.

Paragraphs 146 and 147 of "The Queen's Regulations and Orders for the Army," are to be amended as follows:—

Exchanges on Full Pay.

146. All applications for exchange of regiments between Officers on full pay are to be forwarded to the Military Secretary, and recommended by their respective Commanding Officers, and are to be accompanied, in accordance with the provisions of the Royal Warrant, by a declaration from each Officer—certified by Commanding Officers—to the effect "that the exchange recommended does not originate in any cause affecting the honour, or character, or professional efficiency of the Officers," and further, "that they do not intend to sell out or retire upon half pay after effecting such exchange, but that it is their bonâ fide intention to join immediately and do duty with the corps into which they exchange, the leave of absence which may have been granted to either or both being cancelled by such exchange."

Applications for exchange of battalions are to be forwarded to the Adjutant-General, and recommended by both Commanding Officers. It is not necessary that they should be accompanied by the above certificate.

Medical Certificates.

147. The certificate of a military Medical Officer will also be required in either case, to the effect "that the Officer is in a fit state of health to serve

"at the station where the regiment or battalion into which he applies to ex-
"change is quartered."

Leave of Absence for Medical Officers.

G. O. 93.

Paragraph 682 of "The Queen's Regulations and Orders for the Army," is to be amended as follows :—

682. Applications for leave of absence for Medical Officers are to be made in the following manner :—

I. Medical Officers not attached to regiments are first to obtain the permission of the military authorities of the district in which they are serving, and are then to apply, through the Principal Medical Officer, to the Director-General of the Army Medical Department, who will forward the application to the Adjutant-General, by whom the grant of such leave will be notified to the district authorities, and to the Director-General, who will inform the Officer (through the Principal Medical Officer).

II. Medical Officers attached to regiments are first to obtain the permission of the Principal Medical Officer, and are then to apply to their Commanding Officers, who will forward the application to the district military authorities for transmission to the Adjutant-General, by whom the grant of such leave will be notified, through the district authorities, to the Regimental Medical Officer.

Officers Commanding, in recommending Medical Officers for leave of absence on private affairs, will be careful to ascertain that the distribution and state of health of their corps, as well as the arrangements for the carrying on of all the regimental medical duties, are such as to justify their recommendation.

All applications are to be on W. O. Form 1,119.

Courts-Martial (Medical Certificate).

G. O. 100. 1st November, 1870.

In the Medical Certificate prescribed by paragraph 753 of the Queen's Regulations to be laid before courts-martial, the words —"to undergo corporal punishment, or"—should be omitted, except in cases of soldiers tried while on active service in the field.

Recruiting (Chest Measurement).

G. O. 111. 1st December, 1870.

With reference to G. O. 104, of 1869, the chest measurement of recruits is to be made by placing the measuring tape quite horizontally round the chest, the lower edge of the tape touching the upper part of the nipple, the arms hanging loosely; the tape should not be drawn so tight as to compress the surface. The recruit should then be made to count slowly from 1 to 10, to prevent any undue inflation of the chest. The length in inches shown on the application of the tape is the correct chest measurement.

Posting of Officers.

G. O. 3. 1st January, 1871.

When applications are made to the Adjutant-General for the exchange of an officer from one battalion to another of the same regiment, certificates are to be transmitted showing "that they do not intend to sell out or retire upon "half-pay after effecting such exchange, but that it is their bonâ fide intention "to join and do duty immediately, the leave of absence which may have been "granted to either or both being cancelled by the exchange."

Recruiting (Short Sight).

Circular Memorandum. Horse Guards, 3rd August, 1870.

1. Officers Commanding regiments are authorized to enlist at regimental head-quarters, and in the vicinity, such recruits as they may consider eligible without reference to height, but not to relax attention to full chest development and eligibility in all other respects.

2. With reference to the instructions for the medical examination of recruits, dated 1st July, 1870, it is notified that the Medical Officer will adhere strictly to the necessity that the vision of the recruit be sufficiently good to enable him to see clearly—that Paragraph 3 of Clause D be carefully attended to, but that Paragraph 8 of the same Clause, as regards short sight, is so far modified that each test dot on the card now required to be seen distinctly at 15 feet may, till further notice, be tested for a distance of 10 feet only.

3rd. DEPARTMENTAL CIRCULARS.

Instruction in Midwifery and Nursing the Sick.

Circular Memorandum. 14th November, 1870.

To Principal Medical Officers at Home and Abroad.

With the sanction of the Secretary of State for War, and His Royal Highness the Field-Marshal Commanding-in-Chief, instructions in midwifery and nursing the sick have, for some time back, been systematically given at Sir P. Dun's Hospital in Dublin, and elsewhere, to a select number of soldiers' wives; and diplomas of qualification have been granted to such of them as have passed the prescribed examinations.

As many of these qualified midwives and nurses have already rejoined their husbands' regiments, after the above tuition, Principal Medical Officers are invited to advise Medical Officers in charge of corps to take every opportunity, with the general concurrence of their Commanding Officers, of encouraging the employment of these skilled women as attendants on cases of child-birth and of general sickness wherein trained nursing is essential, when their services can be made available, in preference to those who have not through such educational course acquired the necessary qualifications.

Certificate of Competency in Midwifery and Nursing.

Sir, 24th November, 1870.

To Principal Medical Officers of Districts in which Female Hospitals are established.

With reference to my letter dated 4th July last, forwarding a printed circular promulgating general regulations for the information of the Medical Officer attached to the Female Hospital at in the instruction of such soldiers' wives in midwifery and nursing as may be selected for training;

I have the honour to forward the accompanying form of certificate to be granted to such women who, after a careful examination at the termination of the course of instruction, shall be found qualified to undertake the duties of a midwife.

Station, _____

Date, _____

We certify that Mrs. _____ wife of _____ of the _____ Regiment, duly attended a course of instruction in Midwifery and Sick Nursing at the Hospital for Women and Children, at _____, and that having passed a careful and searching examination, she is fully qualified to undertake the duties of a Midwife, and also of Nurse in cases of general sickness.

Signatures, _____

Expenditure of Medicines.

Sir, 25th November, 1870.

To Principal Medical Officers at Home and Abroad.

I have the honour to enclose herewith a copy of a new War Office Form (No. 630), which it has been considered expedient to issue, with a view of controlling the expenditure of Medicines, &c., in Army Hospitals.

You will be good enough to instruct Medical Officers doing duty at to obtain the requisite supply of the above War Office Form, in the usual manner through their respective Commanding Officers, and cause them to

be filled up and rendered to you monthly, in order that you may examine them and ascertain if the expenditure shown in them is satisfactory.

After examination, they should be transmitted to this Office, with any observations on them which you may deem it expedient to offer, in regard to any excess of expenditure or other irregularity which may have been found to exist in them.

Medical Inspection of Drafts for Foreign Service.

Sir, 29th November, 1870.

To Principal Medical Officers at Home Stations

I have the honour to request that on every occasion on which troops are about to leave your district with a view to embarkation for a foreign station, you will take an opportunity of inspecting them as to their fitness for foreign service, either in conjunction with the Regimental Surgeon, or subsequent to his inspection, but always at as late a period as is consistent with the arrangements for embarkation being thoroughly carried out.

You will be pleased to arrange this inspection in communication with the military authorities within your district.

Annual Returns of Recruits.

Memorandum. 12th December, 1870.

For the year 1870, and in future, two Returns of Recruits, W. O. Form 1038, will be required to accompany each Annual Return of Sick, W. O. Form 298. One of these is to contain the particulars of all recruits enlisted for the corps to which the Return refers; and the other, in which the heading should be altered in MS. to "Recruits for other Corps examined by the Medical Officers of the_____Regiment," will show all other recruits who may have been examined.

These documents will of course, in each case, include all men examined by the Assistant-Surgeon, as well as by the Surgeon, and care must be taken that the total of the columns marked "Inspected" in the two returns, agrees with the number of names entered during the year in the Regimental and Detachment Recruit Registers.

Inspection of Drafts for Foreign Service.

21st January, 1871.

Medical Circular, No. 4, dated 25th May, 1861, and Medical 1 63 dated 1st May, 1863.

The Principal Medical Officer, Her Majesty's British Forces in India, having called attention to several recent cases in which both young soldiers and transferred men were found, shortly after their arrival in that country, to be physically unfit to withstand the climate, the following instructions are promulgated to Medical Officers in supersession of the former Circulars noted in the margin.

1. In time sufficient, prior to the embarkation of regiments or drafts for foreign service, the men are invariably to be inspected by the Surgeon or Medical Officer in charge of the Corps or Depôt to which they belong, and, subsequently, by the Principal Medical Officer of the division or district, as near to the date of embarkation as may suit the military arrangements.

2. At such inspections the medical history sheet of each soldier should, if possible, be available for reference by the Inspecting Officer, with the view that the medical antecedents of the man may be taken into consideration before deciding as to his fitness to proceed on service.

3. When soldiers of less than one year's service are pronounced unfit to proceed, a return on the form annexed (W.O. F. 522), giving full particulars under each heading, is to be forwarded to this office.

4. A similar course is to be pursued by the Medical Officer in charge in respect of transfers from one regiment or corps to another.

T. G. Logan, *Director-General.*

APPENDIX No. XXX.

ABSTRACT No. 1, showing the Admissions into Hospital, Deaths, and Invaliding among the Troops in the United Kingdom in 1869.

Diseases.	Household Cavalry.			Cavalry.			Military Train.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Roy. Art. Depôt Brigade.			Depôt Battalions.		
Strength	1,216			7,923			1,644			7,912			5,642			31,541			2,398			10,686		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
I. *General Diseases.*																								
1. Febrile:																								
Small Pox	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	5	..	..
Cow Pox	..	..	..	2	..	..	..	..	..	5	..	..	..	..	..	16	..	..	21	..	..	43	..	..
Chicken Pox	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	3	..	..
Measles	..	..	..	2	..	..	..	..	..	7	..	..	15	..	..	35	..	..	..	..	..	10	..	..
Scarlet Fever	..	..	..	4	1	..	3	..	..	3	..	..	4	..	..	21	..	..	2	..	..	30	2	..
Typhus „	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	4	1	..	..	..	..	3	2	..
Cerebro-Spinal Fever	..	..	..	..	..	..	..	..	..	3	3	..	..	..	..	1	1	..	..	..	..	..	..	..
Enteric Fever	..	..	..	5	2	..	1	1	..	3	1	..	7	3	..	20	5	..	..	..	..	6	..	..
Relapsing „	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Simple continued Fever	..	..	5	51	..	..	15	1	..	54	..	..	73	2	..	370	3	..	12	..	..	69	1	..
Febricula	..	..	4	48	..	..	9	..	..	77	..	..	26	..	..	291	..	..	7	..	..	108	..	..
Ague	..	..	..	13	..	..	3	..	..	68	..	..	3	..	..	245	..	..	27	..	..	175	..	1
Remittent Fever	..	..	..	4	..	..	..	..	..	..	..	..	2	..	..	15	1	..	..	..	..	5	..	..
Simple Cholera	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Influenza	..	..	..	73	..	..	40	..	..	61	..	..	77	..	..	327	..	..	142	..	..	25	..	..
Erysipelas	..	..	1	11	..	..	2	..	..	13	..	..	4	..	..	39	..	..	3	..	..	18	..	..
Pyæmia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	1	..	1
Mumps	..	..	2	4	..	..	..	..	..	3	..	..	5	..	..	31	..	..	..	..	..	18	..	..

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Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Military Train.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Roy. Art. Depôt Brigade.			Depôt Battalions.		
Strength	1,216			7,923			1,644			7,912			5,642			31,541			2,398			10,686		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Chorea	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	1	..	..	..	..	..	5	..	..
Neuralgia	2	..	..	36	..	..	4	..	..	18	..	2	6	..	..	78	..	4	10	..	..	63	..	3
Hypochondriasis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	1	..	..	..	2	..	..
Mania	..	..	..	1	1	2	..	..	..	5	..	3	4	1	..	16	..	15	..	..	..	2	..	..
Dementia	..	..	..	4	..	3	3	..	2	6	..	8	3	1	3	30	..	23	5	..	2	24	1	7
Hysteria	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..
Spasm	..	..	..	3	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Melancholia	..	..	..	1	..	..	..	..	..	2	..	..	..	..	..	4	..	..	2	..	..	2	..	..
Headache	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Stuttering	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
2. Of the Eye:																								
Abscess	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	1	..	..	..	..	..
Conjunctivitis	2	..	1	82	..	..	6	..	..	66	..	1	40	..	..	398	..	11	21	..	1	145	..	10
Fatty Tumour	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Tarsal Ophthalmia	..	..	..	5	..	..	1	..	..	14	..	4	4	..	..	71	..	11	1	..	..	54	..	1
Gonorrhœal „	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..
Iritis	1	..	..	7	..	..	..	..	..	7	..	2	4	..	..	19	..	2	1	..	..	4	..	..
Sclerotitis	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Glaucoma	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Amaurosis	..	..	..	3	..	3	..	..	..	4	..	4	..	..	..	5	..	1	..	..	..	1	..	1
Protrusion of Eyeball ..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cataract	..	..	..	1	..	1	..	..	..	1	..	..	..	..	..	..	..	1	2	..	..	2	..	..

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Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Military Train.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Roy. Art. Depôt Brigade.			Depôt Battalions.		
Strength	1,216			7,923			1,644			7,912			5,642			31,541			2,398			10,686		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Atrophy of Heart	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..
Degeneration „	..	..	..	1	1	1	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..
Rupture „	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
Aneurism „	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
Palpitation „	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	6	..	..	..	..	..	1	..	..
Aneurism of Aorta	..	..	..	2	..	1	1	..	1	27	..	11	3	..	2	124	..	16	20	..	4	50	..	6
Aneurism	..	..	..	2	7	..	3	2	..	9	11	2	..	2	..	19	15	9	2	1	..	8	9	4
Phlebitis	..	..	..	2	1	1	..	..	..	2	1	..	3	2	1	1	1	..	..	..	..	6	..	2
Varicose Veins ..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..
Angina Pectoris ..	..	..	..	2	..	5	7	..	5	12	..	16	3	..	1	48	..	25	4	..	2	19	..	13
Syncope	..	..	..	1	..	..	..	..	..	2	..	..	..	..	..	1	..	1	..	..	..	..	..	..
Degeneration of Aorta ..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	3	..	..	..	..	..	1	..	..
Narrowing „ ..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	1	..	..	..	..	..	2	1
Dilatation „ ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..
6. Absorbent System:																								
Inflammation of Lymphatics ..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	7	..	..	1	..	..	..	..	..
„ „ Glands ..	9	..	..	74	..	..	9	..	..	77	..	..	65	..	..	297	..	..	14	..	..	105	..	..
Suppuration „ „ ..	..	..	..	22	..	..	6	..	..	12	1	..	22	..	..	66	..	1	2	..	..	24	..	..
Hypertrophy „ „ ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Tumour	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	1
7. Of Ductless Glands:																								
Goitre	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..
Addison's Disease ..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	1	1	..	..	..	..	..	..	..

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Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Military Train.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Roy. Art. Depôt Brigade.			Depôt Battalions.		
Strength	1,216.			7,923			1,644			7,912			5,642			31,541			2,398			10,686		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Chronic Ulcer of Stomach	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Hæmatemesis	..	..	..	..	..	..	2	1	..	2	..	..	..	..	..	3	2	..	5	..	..	..	..	..
Dyspepsia	29	..	..	88	..	..	21	..	..	187	..	3	99	..	..	450	..	6	85	..	..	193	..	2
Enteritis	..	..	..	..	..	..	1	..	..	2	..	..	..	..	..	5	1	..	..	..	..	..	..	..
Typhlitis	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1	..
Dysentery	..	..	..	6	..	..	..	..	..	10	..	3	..	..	..	31	..	5	7	..	2	43	..	3
Ulceration of Intestines	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fæcal Abscess	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Melæna	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Tympanitis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Obstruction of Intestines	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	1	..	..
Stricture of Intestines	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Hernia	1	..	1	15	..	17	2	..	2	11	..	14	2	..	..	43	..	28	1	..	..	31	..	8
Worms	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Diarrhœa	20	..	..	76	..	1	13	..	..	119	..	3	51	..	..	362	..	3	50	..	..	103	1	..
Colic	5	..	1	15	..	..	5	..	..	17	..	..	27	..	..	82	..	..	8	..	..	11	..	..
Constipation	..	..	..	4	..	..	..	..	..	4	..	..	2	..	..	27	..	..	..	..	..	11	..	..
Abscess of Anus	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,, Rectum	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	5	..	..
Fistula in Ano	..	..	..	7	..	..	..	..	..	8	..	2	2	..	..	19	..	1	5	..	1	11	..	..
Hæmorrhoids	1	..	..	29	..	..	5	..	..	38	..	1	9	..	..	106	..	1	14	..	..	42	..	..
Fissure of Anus	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	1	..	..
Prolapsus of Rectum	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	1	..	..	..	2	1	1
Condyloma of the Anus	..	..	..	4	..	..	4	..	..	4	..	..	1	..	..	18	..	..	14	..	..	9	..	..

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Abstract No. 1—*continued.*

	Household Cavalry			Cavalry.			Military Train.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Roy. Art. Depôt Brigade.			Depôt Battalions.		
Strength	1,216			7,923			1,644			7,912			5,642			31,541			2,398			10.686		
Diseases.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
Stricture of Urethra	1	..	..	27	..	3	2	..	1	28	..	2	10	..	..	79	..	8	7	..	..	47	..	2
Urinary Fistula	..	..	..	9	..	3	..	..	..	2	..	..	..	..	1	7	..	3	..	..	..	3	..	1
Extravasation of Urine	..	..	..	1	1	..	..	..	..	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..
11. Generative System:																								
Œdema	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	2	..	..
Varicocele	1	..	..	2	..	1	..	..	..	1	..	1	1	..	..	2	..	1	2	..	..	1	..	..
Fibrous Tumour	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Hydrocele	..	..	..	5	..	..	..	..	..	4	..	1	6	..	..	23	..	2	..	..	..	12	..	1
Orchitis	6	..	..	101	..	6	21	..	1	89	..	5	32	..	..	310	..	2	19	..	2	133	..	2
Testicle not descended	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Hypertrophy of male Mamilla ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..
Sloughing of Scrotum	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Spermatorrhœa	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..
Abscess	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..
Protrusion of Tubuli	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	1	..	..
Fungus of Testicle	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Neuralgia „	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Hæmatocele	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
12. Organs of Locomotion:																								
Malformation	..	..	..	..	..	..	..	..	..	9	..	3	6	..	..	1	..	3	..	..	..	..	..	1
Ostitis	..	..	..	19	..	2	..	..	..	..	..	..	..	..	..	32	..	2	2	..	1	15	..	1
Osseous Tumour	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	2	..	..

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Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Military Train.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Roy. Art. Depôt Brigade.			Depôt Battalions.		
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Carbuncle	3	..	..	9	..	..	..	..	..	7	..	..	2	..	..	24	..	..	..	..	..	2	..	..
Whitlow	4	..	..	31	..	1	2	..	..	45	..	..	8	..	..	131	..	..	10	..	..	42	..	..
Molluscum	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Itch	4	..	..	91	..	..	7	..	..	93	..	..	76	..	..	652	..	..	54	..	..	366	..	..
Warts	..	..	..	14	..	..	1	..	..	30	..	..	7	..	..	52	..	..	14	..	..	43	..	..
Corns	1	..	..	3	..	..	..	..	..	4	..	1	..	..	..	13	..	..	..	..	..	3	..	..
Sebaceous Tumour	1	..	..	..	..	..	..	..	..	3	..	..	6	..	..	..	..	..	..	..	..	..	..	..
Ephidrosis	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Miliaria	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Thecal Abscess	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ecthyma	..	..	..	3	..	..	..	..	..	4	..	..	..	..	..	2	..	..	..	..	..	9	..	..
Pemphigus	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Prurigo	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	5	..	..	..	..	..	..	..	..
Chilblain	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	5	..	..	..	..	..	..	..	..
Erythema	..	..	..	2	..	..	..	..	..	8	..	..	3	..	..	14	..	..	..	..	..	3	..	..
Tinea	..	..	..	16	..	..	3	..	..	7	..	..	6	..	..	53	..	..	4	..	..	27	..	..
Tumour	..	..	..	2	..	..	1	..	..	1	..	..	..	..	..	6	..	1	3	..	..	3	..	..
Ingrown Nail	..	..	..	2	..	..	..	..	..	5	..	..	..	..	..	10	..	..	2	..	..	7	..	..
Abscess	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	15	..	..	..	..	..	..	..	..
Acne	..	..	..	..	..	..	1	..	..	4	..	..	..	..	..	10	..	..	..	..	..	2	..	..
Lepra	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Intertrigo	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	4	..	..	..	..	..	1	..	..
Sycosis	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	7	..	1	2	..	..	3	..	..
Gangrene	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..

Rupia	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	2	..	..	..	..	..
Phthiriasis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Ichthyosis	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	2	..	..
III. *Conditions, &c.*																								
General Debility	4	..	3	18	..	17	1	..	..	24	..	17	6	..	4	114	..	39	9	1	10	83	..	21
Old Age	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
IV. *Poisons.*																								
Delirium Tremens	..	1	..	17	1	..	1	..	..	23	..	..	14	..	2	71	4	..	4	..	..	46	..	..
Wounds	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Alcohol	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	11	3	..	..	..	..	..	..	..
Oxalic Acid	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
V. *Injuries.*																								
2. Accidental:																								
Burns and Scalds	1	..	..	11	..	..	2	..	..	15	..	..	7	..	..	85	..	..	7	..	..	50	..	..
Multiple Injury	2	1	..	..	1	..	1	..	..	1	1	..	1	..	..	6	2	..	..	..	..	..	..	..
Asphyxia by Drowning	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	14	..	..	1	..	3	6	..
Exposure to Cold	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..
Contusion	55	..	..	475	..	..	57	..	..	569	..	2	96	..	..	1014	..	4	176	..	1	374	..	..
Concussion of the Brain	..	..	..	3	..	..	..	..	..	..	..	..	1	..	..	2	..	1	..	..	..	..	..	..
Fracture	5	..	1	66	3	5	5	..	..	35	2	9	16	1	..	118	4	17	4	..	..	41	..	2
Wounds	23	..	..	107	1	4	16	..	..	77	..	1	120	..	..	442	1	2	42	..	1	147	..	..
" from Gunshot	..	..	..	3	..	1	..	..	..	1	..	1	2	..	..	4	..	1	1	..	1	2	..	..
Sprain	18	..	..	194	..	1	22	..	..	163	..	2	85	..	..	745	..	9	58	..	..	276	..	4
Dislocation	2	..	..	12	..	..	..	..	..	8	..	1	4	..	1	30	..	4	1	..	..	7	..	4
Blisters of the Feet	1	..	..	22	..	..	1	..	..	31	..	..	20	..	..	141	..	..	19	..	..	46	..	..
Fish Bite	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Rupture of Urethra	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Injury to Spinal Cord	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Killed on Rail	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Rupture of Muscles	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..
Injury of the Eye	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
3. Homicidal:																								
Gunshot	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
Bayonet Wound	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..
Stab	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
Scalp Wound	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..

Abstract No. 1—*continued.*

Diseases.	Household Cavalry.			Cavalry.			Military Train.			Royal Artillery.			Foot Guards.			Infantry Regiments.			Roy. Art. Depôt Brigade.			Depôt Battalion.		
Strength	1,219			7,923			1,644			7,912			5,642			31,541			2,398			10,686		
	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.	Admitted.	Died.	Invalided.
4. Self-inflicted:																								
Poison	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Gunshot Wound	..	..	..	1	4	..	..	..	..	..	3	..	1	..	..	1	6	..	..	..	..	2	4	..
Multiple Injury	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
Cut Throat	..	..	..	1	..	..	..	..	..	1	..	..	1	..	2	4	3	..	..	..	..	2	2	..
Drowning	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..
5. Judicial:																								
Hanging	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..
Corporal Punishment ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
VI. *Surgical Operations.*																								
Amputation of Thigh	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
,, Foot	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	1	..	..	..	..	..	..
,, Fingers	..	..	..	..	..	1	..	..	..	2	..	1	..	..	..	1	..	..	..	..	..	1	..	..
,, Shoulder	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
,, Ankle Joint	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1
,, Toe	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	1	..	..
Excision of Knuckle ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Not specified	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
No appreciable Disease	..	..	..	4	..	..	..	..	..	7	..	..	1	..	..	25	..	..	..	..	..	34	..	..
Total	650	10	28	5831	60	233	853	14	78	6275	74	344	3617	45	147	23,092	232	964	2466	15	82	9,735	132	501

APPENDIX No. XXX—*continued.*

ABSTRACT No. 2, showing the Number of Men belonging to the Regiments serving at Home who were Vaccinated during the Year 1869.

	Results.	In those who bore Marks of previous Small-pox.	In those who bore good Marks of previous Vaccination.	In those who bore doubtful Marks of previous Vaccination.	In those who bore no Marks of previous Vaccination or Small-pox.	Total.
Soldiers, not Recruits.	A perfect vaccine pustule	8	84	12	15	119
	A modified ditto	21	183	6	19	229
	A failure in	9	112	10	1	132
	Total	38	379	28	35	480
Recruits.	A perfect vaccine pustule	159	2,724	82	252	3,217
	A modified ditto	180	3,672	109	98	4,059
	A failure in	251	3,361	41	82	3,735
	Total	590	9,757	232	432	11,011

APPENDIX No. XXX.—*continued.*

ABSTRACT No. 3, showing the Ages of the Troops serving in the United Kingdom, and the Deaths at each Age, during the Year 1869.

	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.
Household Cavalry	150	..	353	1	304	6	181	1	110	..	118	2	1,216	10
Cavalry of the Line	1,043	3	2,344	14	2,259	13	1,532	18	509	9	236	3	7,923	60
Royal Artillery	1,362	5	2,206	11	1,612	21	1,879	26	714	8	139	3	7,912	74
Military Train	206	..	506	2	494	7	313	4	104	..	21	1	1,644	14
Foot Guards	87	2	1,787	13	1,532	9	946	11	419	9	86	1	5,642	45
Infantry Regiments	5,531	15	7,166	34	9,682	59	6,355	78	2,463	37	344	9	31,541	232
Total	9,164	25	14,362	75	15,883	115	11,206	138	4,319	63	944	19	55,878	435
Depôt Brigade, R.A.	923	1	609	..	418	2	291	8	91	5	66	..	2,398	16
Depôt Battalions	2,775	11	2,353	19	2,362	25	1,699	45	1,159	21	338	9	10,686	130
Coast Brigade, R.A.	5	..	63	..	352	3	592	2	404	11	249	6	1,665	22
Total	3,703	12	3,025	19	3,132	30	2,582	55	1,654	37	653	15	14,749	168

APPENDIX No. XXX—*continued.*

ABSTRACT No. 4, showing the Number of Recruits Inspected, and the Number found unfit for Service in each of the Recruiting Districts, during the Year 1869.

Districts.		Primary Inspections.	Secondary Inspections.		Total.
			Had been previously examined by Staff Surgeon or other Army Medical Officer.	Had been previously examined by Private Medical Practitioner.	
London ..	Inspected	4,083	295	1,375	5,753
	Rejected	1,522	11	91	1,624
Liverpool ..	Inspected	1,221	75	153	1,449
	Rejected	494	13	41	548
Bristol ..	Inspected	317	19	397	733
	Rejected	146	3	56	205
York ..	Inspected	50	199	191	440
	Rejected	17	15	34	66
Glasgow ..	Inspected	659	108	26	793
	Rejected	337	14	6	357
Dublin ..	Inspected	553	61	64	678
	Rejected	175	3	5	183
Belfast ..	Inspected	469	56	129	654
	Rejected	99	1	10	110
Total	Inspected ..	7,352	813	2,335	10,500
	Rejected ..	2,790	60	243	3,093

ABSTRACT No. 5, showing the Native Country of the Recruits inspected at the Head Quarters of each of the Districts in 1869.

Districts.	England.		Wales.		Scotland.		Ireland.		British Colonies or Foreign Countries.	
	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.	Inspected.	Rejected.
London ..	3,834	1,414	..	..	63	26	168	76	18	6
Liverpool ..	680	314	100	30	45	16	383	129	13	5
Bristol ..	283	127	17	8	2	1	15	10	..	..
York ..	47	15	..	..	..	..	3	2	..	..
Glasgow ..	30	14	..	..	451	225	178	98	..	..
Dublin ..	31	10	..	..	9	2	506	162	7	1
Belfast ..	23	3	..	..	12	2	428	93	6	1
Total ..	4,928	1,897	117	38	582	272	1,681	570	44	13

APPENDIX No. XXX—*continued.*

ABSTRACT No. 6, showing the Ages of Recruits Inspected in 1869.

	Boys under 17.	From 17 to 18.	From 18 to 19.	From 19 to 20.	From 20 to 21.	From 21 to 22.	From 22 to 23.	From 23 to 24.	From 24 to 25.	25 and Upwards.
At Head Quarters of Recruiting Districts	114	592	2,208	1,507	813	693	510	459	324	132
At Regiments and Depôts* ...	289	858	1,547	1,130	675	527	407	327	208	84
By Civil Medical Practitioners ...	26	237	1,391	954	590	397	342	218	143	24
Total	429	1,687	5,146	3,591	2,078	1,617	1,259	1,004	675	240

* One Regimental Return contains information as to ages of 30 men found fit, instead of 53 primarily inspected.

ABSTRACT No. 7, showing the Heights of the Recruits Inspected in 1869.

	Under 5 ft. 3 in	From 5 ft. 3 in. to 5 ft. 4 in.	From 5 ft. 4 in. to 5 ft. 5 in.	From 5 ft. 5 in. to 5 ft. 6 in.	From 5 ft. 6 in. to 5 ft. 7 in.	From 5 ft. 7 in. to 5 ft. 8 in.	From 5 ft. 8 in. to 5 ft. 9 in.	From 5 ft. 9 in. to 5 ft. 10 in.	From 5 ft. 10 in. to 5 ft. 11 in.	From 5 ft. 11 in. to 6 ft.	6 ft. and Upwards.
At Head Quarters of Recruiting Districts ...	122	46	271	734	2,656	1,567	1,062	511	222	107	54
At Regiments & Depôts. *	243	38	279	751	1,612	1,303	832	437	211	140	156
By Civil Medical Practitioners	22	7	192	278	1,313	1,066	665	465	179	97	38
Total	387	91	742	1,763	5,581	3,936	2,609	1,413	612	344	248

* One Regimental Return contains information as to heights of 30 men found fit, instead of 53 primarily inspected.

APPENDIX No. XXX—*continued.*

ABSTRACT No. 8, showing the Number of Recruits inspected in 1869, at the Head-Quarters of Recruiting Districts, at the following Weights and Ages.

Ages.	Under 100 lbs.	From 100 lbs. to 110 lbs.	From 110 lbs. to 120 lbs.	From 120 lbs. to 130 lbs.	From 130 lbs. to 140 lbs.	From 140 lbs. to 150 lbs.	From 150 lbs. to 160 lbs.	From 160 lbs. to 170 lbs.	From 170 lbs. and upwards.	Total.
Boys under 17	91	17	6	...	...	...	...	...	...	114
From 17 to 18	4	63	201	204	94	22	4	...	...	592
„ 18 to 19	...	16	369	858	573	321	51	19	1	2,208
„ 19 to 20	...	3	160	518	404	319	81	14	8	1,507
„ 20 to 21	...	1	35	212	251	179	89	32	14	813
„ 21 to 22	...	...	18	154	223	173	92	25	8	693
„ 22 to 23	...	...	19	71	163	133	82	32	10	510
„ 23 to 24	...	...	12	52	146	142	70	29	8	459
„ 24 to 25	...	...	4	35	93	97	66	19	10	324
Upwards of 25	...	...	1	27	43	28	20	8	5	132
Total	95	100	825	2,131	1,990	1,414	555	178	64	7,352

ABSTRACT No. 9, showing the State of Education of the Recruits examined at the Head Quarters of the Recruiting Districts and at Regiments and Depôts in 1869.

	Well Educated.	Able to Write.	Able to Read only.	Unable to Read.	Total.
Recruiting Districts ..	348	4,853	491	1,660	7,352
Regiments and Depôts	591	4,129	552	803	6,075
Total	939	8,982	1,043	2,463	13,427

APPENDIX No. XXX—*continued.*

ABSTRACT No. 10, showing the Admissions into Hospital and Deaths, among the Troops serving in the Mediterranean during the year 1869; and the Disabilities of the Invalids sent to England and of those discharged the service at Netley during the same period.

Stations	Gibraltar.		Malta.		Native Troops. R. Malta Fencibles.		Gibraltar.		Malta.		
Strength	4,633		5,027		547		Invalids.		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Netley.	Discharged at Malta.
I. *General Diseases.*											
1. Febrile:											
Small Pox	1	..	..	..	..	..	..	..	..	..	..
Measles	..	..	2	..	1	..	..	..	..	..	..
Scarlet Fever	..	..	1	..	..	..	..	..	..	..	..
Enteric „	6	4	19	1	..	..	1	..	1	..	..
Simple Continued Fever	165	..	734	2	9	..	5	..	..	..	..
Febricula	14	..	151	..	25	..	..	..	..	..	..
Ague	12	..	48	1	1	..	1	..	..	..	..
Remittent Fever	23	1	1	..	..	..	2	..	..	..	..
Mumps	..	..	3	..	..	..	..	..	..	..	..
Erysipelas	3	..	8	..	1	..	..	..	..	..	..
2. Constitutional:											
Acute Rheumatism	43	..	71	..	23	..	..	..	..	..	..
Chronic „	84	..	58	..	2	..	13	11	5	2	1
Muscular „	14	..	34	..	3	..	2	..	..	..	..
Gon: Rheumatism	1	..	..	..	..	..	1	..	..	..	..
Primary Syphilis	303	..	22	..	8	..	..	..	..	..	..
Secondary „	119	..	27	..	1	..	9	4	4	4	..
Cancer	..	..	1	..	..	1	..	..	..	..	..
Lupus	2	..	..	..	..	..	1	..	..	..	..
Rodent Ulcer	..	..	1	..	..	..	..	..	..	..	..
Scrofula	2	..	4	..	1	..	2	1	1	..	..
Phthisis Pulmonalis	30	6	29	2	..	..	25	30	19	28	..
Hæmoptysis (Tub.)	10	1	6	..	..	..	5	1	..	..	..
Acute Miliary Tuberculosis	..	..	1	..	..	..	..	..	..	..	..
Diabetes	1	..	..	..	..	..	..	1	..	..	..
Purpura	..	..	..	..	..	..	..	..	1	..	..
Scurvy	3	..	2	..	..	..	2	..	..	..	..
Anæmia	9	..	..	..	..	..	1	..	..	..	..
General Dropsy	..	..	2	1	..	..	..	..	..	..	..
II. *Local Diseases.*											
1. Of the Nervous System:											
Meningitis	..	..	1	..	..	..	..	..	..	..	..
Apoplexy	..	..	2	4	..	1	..	..	1	..	..
Sunstroke	2	..	1	..	..	..	..	..	..	..	..
Paralysis	6	2	7	1	..	..	2	..	3	5	..
Epilepsy	17	..	15	..	..	..	5	..	4	1	..
Convulsions	..	..	..	..	1	..	..	..	..	..	..
Neuralgia	9	..	7	..	1	..	..	..	..	..	..

Abstract No. 10—*continued.*

Stations	Gibraltar.		Malta.		Native Troops. R. Malta Fencibles.		Gibraltar.		Malta.		
Strength	4,633		5,027		547		Invalids.		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Netley.	Discharged at Malta.
Hypochondriasis	..	..	..	..	1	..	..	..	..	..	..
Mania	2	..	4	..	..	..	1	..	..	..	1
Melancholia	1	..	..	..	..	..	1	..	..	.	..
Dementia	5	..	9	..	1	..	5	..	3	..	..
Stammering	..	..	..	..	..	..	1	1	..	..	..
2. Of the Eye:											
Conjunctivitis	95	..	117	..	40	..	8	5	..	2	..
Tarsal Ophthalmia ..	15	..	2	..	5	..	3	..	..	..	..
Keratitis	8	..	..	..	..	..	..	1	..	..	..
Sclerotitis	..	..	1	..	..	..	..	..	..	..	..
Iritis	2	..	1	..	..	..	..	..	1	2	..
Retinitis	..	..	..	..	..	..	..	..	..	1	..
Amaurosis	..	..	1	..	..	..	..	..	1	..	..
Impaired Vision	..	..	2	..	..	..	..	..	..	..	2
Short Sight	..	..	2	..	..	..	..	..	..	..	..
Lachrymal Obstruction ..	..	..	1	..	..	..	..	..	..	..	..
Hordeolum	..	..	2	..	..	..	..	..	..	..	..
Trichiasis	..	..	..	..	..	..	..	2	..	..	..
Cyst of Eyelid	..	..	2	..	..	..	..	..	..	..	..
3. Of the Ear:											
Inflam. External Meatus ..	5	..	..	..	..	..	..	..	..	..	..
Inflam. Membr. Tympani ..	4	..	3	..	1	..	..	..	..	..	..
Abscess	..	..	5	..	..	..	..	..	..	..	..
Deafness	3	..	2	..	..	..	..	1	..	..	..
4. Of the Nose:											
Ozæna	1										
Epistaxis	1	..	1	..	..	..	..	..	..	..	..
5. Circulatory System:											
Pericarditis	2	..	3	1	..	..	1	..	1	..	..
Carditis	..	..	6	..	..	..	..	..	..	..	..
Valve Disease of Heart ..	9	2	7	..	1	..	8	10	3	8	..
Hypertrophy „ ..	3	..	9	..	..	..	2	1	3	..	..
Atrophy of Heart	..	..	2	..	..	..	..	..	..	..	..
Aneurism „	2	..	..	..	..	..	..	..	..	..	..
Rupture of Ventr: of Heart	..	1	..	..	..	..	..	..	..	..	..
Palpitation	16	..	17	..	..	..	2	1	4	8	..
Aneurism of Aorta	2	..	4	4	..	..	1	1	1	..	..
Aneurism	..	1	1	1	..	..	..	..	..	..	..
Phlebitis	1	..	..	..	..	..	..	..	..	..	..
Varicose Veins	2	..	2	..	4	..	5	3	1	1	..
6. Absorbent System ..											
Inflam. of Lymphatics ..	..	..	1	..	..	..	..	..	..	..	..
„ of Glands	14	..	15	..	..	..	..	..	..	..	..
Suppuration „	1	..	2	..	..	..	..	..	..	..	..
Hypertrophy „	2	..	..	..	..	..	..	..	..	..	..
Glandular Tumour	..	..	2	..	..	..	..	..	..	..	..

Abstract No. 10—*continued.*

Stations	Gibraltar.		Malta.		Native Troops. R. Malta Fencibles.		Gibraltar.		Malta.		
Strength	4,633		5,027		547		Invalids.		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Netley.	Discharged at Malta.
7. Respiratory System:											
Laryngitis	..	..	1	..	..	..	..	..	..	..	..
Bronchitis	133	..	143	1	37	..	7	1	6	1	..
Asthma	1	..	2	..	..	..	1	..	..	..	1
Pneumonia	17	2	7	1	2	..	..	..	..	..	..
Emphysema	1	..	..	..	..	..	..	..	..	..	..
Pleurisy	15	1	16	1	1	..	..	..	..	..	..
Hydrothorax	1	..	..	..	..	..	1	..	..	..	..
8. Digestive System:											
Cyst of Lip	1	..	..	..	..	..	..	..	..	..	..
Stomatitis	..	..	5	..	1	..	..	..	..	..	..
Abscess of Cheek	1	..	2	..	..	..	..	..	..	..	..
Gum Boil	1	..	6	..	..	..	..	..	..	..	..
Inflam. of Gums	1	..	..	..	..	..	..	..	..	..	..
Glossitis	..	..	2	..	..	..	..	..	..	..	..
Quinsy	..	..	1	..	..	..	..	..	..	..	..
Tonsillitis	85	..	93	..	30	..	..	..	..	..	..
Gastritis	..	..	..	..	1	..	..	..	..	..	..
Hæmatemesis	..	..	1	1	..	..	..	..	..	..	..
Dyspepsia	123	..	154	..	38	..	..	1	..	..	..
Dysentery	9	..	10	1	..	..	..	..	..	..	..
Diarrhœa	52	..	113	..	26	..	1	1	2	..	..
Hernia	7	..	11	..	1	..	4	8	3	8	2
Colic	3	..	11	..	..	..	..	..	..	..	..
Tænia Solium	3	..	14	..	1	..	..	..	..	..	..
Constipation	9	..	8	..	..	..	..	..	..	..	..
Fistula in Ano	3	..	2	..	..	..	..	..	..	..	..
Hæmorrhoids	14	..	12	..	1	..	..	..	..	..	..
Condyloma of Anus	1	..	2	..	..	..	..	..	..	..	..
Hepatitis	24	..	19	3	..	..	7	2	3	1	..
Congestion of Liver	1	..	..	..	..	..	..	..	..	..	..
Jaundice	11	..	20	1	..	..	..	..	..	..	..
Gall Stone	1	..	..	..	..	..	..	..	..	..	..
Splenitis	2	..	2	..	1	..	1	..	1	1	..
Congestion of Spleen	1	..	..	..	..	..	..	..	..	..	..
Hypertrophy of Spleen	..	..	..	..	1	1	..	..	..	..	..
Peritonitis	1	..	1	..	..	..	..	..	..	..	..
Ascites	..	1	1	..	..	..	..	..	..	..	..
9. Urinary System:											
Bright's Disease	2	1	2	..	..	..	1	1	..	1	..
Nephritis	2	..	2	..	1	..	..	..	..	..	..
Gonorrhœa	305	..	95	..	22	..	..	..	..	..	..
Phimosis, &c.	3	..	2	..	..	..	..	..	..	..	..
Bubo	63	..	1	..	..	..	..	..	..	..	..
Epididymitis Gon:	8	..	5	..	..	..	..	..	..	..	..
Stricture of Urethra	13	..	13	..	2	..	2	..	1	1	..
Urinary Fistula	2	..	..	..	..	..	1	..	..	..	..
Retention of Urine	..	..	1	..	..	..	..	..	..	..	..

Abstract No. 10—*continued.*

Stations	Gibraltar.		Malta.		Native Troops. R. Malta Fencibles.		Gibraltar.		Malta.		
Strength	4,633		5,027		547		Invalids.		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Netley.	Discharged at Malta.
Hæmaturia	1	..	..	..	..	..	..	..	..	..	..
Incontinence of Urine	2	..	2	..	..	..	..	..	..	..	..
Condyloma	1	..	..	..	..	..	..	..	..	..	..
Diuresis	..	..	2	..	..	..	..	..	1	..	..
Urinary Abscess	..	..	1	..	..	..	..	..	1	..	..
Cystitis	..	..	2	..	1	..	..	..	1	1	1
10. Generative System:											
Varicocele	1	..	..	..	..	..	..	..	..	..	..
Hydrocele	..	..	4	..	..	..	..	..	..	..	1
Orchitis	61	..	52	..	1	..	1	1	2	1	..
Œdema of Scrotum	1	..	..	..	..	..	..	..	..	..	..
Hæmatocele	1	..	..	..	..	..	..	..	..	..	..
Abscess of Scrotum	..	..	1	..	..	..	..	..	..	..	..
11. Organs of Locomotion:											
Ostitis	3	..	5	..	..	..	1	2	..	1	..
Caries	..	..	3	..	..	..	..	..	1	..	..
Necrosis	..	..	3	..	..	..	..	..	..	1	..
Synovitis	20	..	5	..	3	..	1	1	..	1	..
Dropsy of Joint	..	..	3	..	..	..	..	..	..	..	..
Enlarged Bursa	1	..	1	..	..	..	..	..	..	..	..
Bunion	2	..	..	..	..	..	..	..	..	..	..
Contraction	..	..	2	..	..	..	..	..	2	3	..
Tumour of Toe	..	..	1	..	..	..	..	..	1	..	..
„ of Humerus	..	..	..	..	1	..	..	..	1	..	..
„ of Tibia	..	..	1	..	..	..	..	..	..	..	..
Malformation of Feet	..	..	3	..	..	..	..	..	1	..	..
12. Of Cellular Tissue:											
Inflam. of Cellular Tissue	2	..	26	..	18	..	..	..	..	..	..
Abscess „ „	49	..	103	..	..	..	2	..	..	..	..
Fibro Cystic Tumour	..	..	1	..	3	..	..	..	1	1	..
13. Cutaneous System:											
Urticaria	1	..	..	..	..	..	..	..	..	..	..
Lichen	1	..	1	..	..	..	..	..	..	..	..
Psoriasis	5	..	8	..	..	..	1	..	..	..	..
Herpes	8	..	7	..	2	..	..	..	..	..	..
Eczema	26	..	31	..	..	..	..	..	1	..	..
Impetigo	5	..	1	..	..	..	..	..	..	..	..
Ulcer	137	..	95	..	28	..	5	2	3	..	..
Boil	112	..	107	..	43	..	..	..	..	..	..
Carbuncle	1	..	2	..	..	..	..	..	..	..	..
Whitlow	5	..	21	..	1	..	..	..	..	..	..
Itch	2	..	14	..	1	..	..	..	..	..	..
Warts	15	..	5	..	..	..	..	..	..	..	..
Erythema	2	..	2	..	..	..	..	..	..	..	..
Acne	1	..	..	..	..	..	..	..	..	..	..

Abstract No. 10—*continued.*

Stations	Gibraltar.		Malta.		Native Troops. R. Malta Fencibles.		Gibraltar.		Malta.		
Strength	4,633		5,027		547		Invalids.		Invalids.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Sent Home.	Discharged at Netley.	Sent Home.	Discharged at Netley.	Discharged at Malta.
Corns	1	..	1	..	..	..	..	..	..	..	..
Ingrown Nail	2	..	5	..	..	..	..	..	..	..	..
Tinea	3	..	2	..	2	..	..	..	..	..	..
Prurigo	..	..	..	..	1	..	..	..	..	..	..
Lepra	..	..	1	..	..	..	..	..	..	..	..
Rupia	..	..	3	..	..	..	..	..	..	..	..
Mentagra	..	..	..	..	1	..	..	..	..	..	..
Irritation by Stings	..	..	2	..	..	..	..	..	..	..	..
III. *Conditions, &c.*											
General Debility	13	..	22	..	..	..	4	11	6	3	..
IV. *Poisons.*											
Delirium Tremens	21	..	39	5	..	..	..	..	..	..	..
Alcohol	65	..	..	..	..	..	..	..	..	..	..
V. *Injuries.*											
2. Accidental:											
Burns and Scalds	7	..	6	..	..	..	..	..	..	..	..
Multiple Injury	4	1	..	..	..	..	1	..	..	..	..
Asphyxia by Drowning	..	1	..	2	..	..	..	..	..	..	..
Contusion	121	..	160	..	16	..	..	..	..	..	..
Concussion of the Brain	1	..	..	..	..	..	..	..	..	..	..
Fracture	16	1	16	3	..	..	..	..	..	1	..
Wounds	76	..	109	..	14	..	1	..	..	..	..
„ from Gunshot	1	..	3	..	..	..	..	..	..	..	..
Sprain	90	..	113	..	3	..	..	..	1	..	..
Dislocation	6	..	5	..	..	..	1	..	..	1	..
Blisters of the Feet	4	..	10	..	..	..	..	..	..	..	..
4. Self-inflicted:											
Contusion	..	..	..	..	1	..	..	..	..	..	..
Concussion of the Brain	..	..	1	1	..	..	..	..	..	..	..
Wounds	..	..	4	3	..	..	..	..	..	..	..
„ Gunshot	..	..	1	1	..	..	..	..	..	..	..
5. Judicial:											
Corporal Punishment	1	..	..	..	..	..	..	..	..	..	..
VI. *Surgical Operations.*											
Ligature of Carotid	..	..	1	1	..	..	..	..	..	..	..
Amputation of Great Toe	..	..	1	..	..	..	..	..	1	2	..
No appreciable Disease	2	..	10	..	1	..	..	..	..	..	..
Total	2,900	26	3,294	43	437	3	159	105	97	91	9

Abstract No. 10—*continued.*

CAUSES of the Deaths among the Invalids.

	From Gibraltar.	From Malta.
Phthisis Pulmonalis	..	1
General Dropsy	..	1
Valve Disease of Heart	2	..
Aneurism	..	1
Bronchitis	..	1
Pneumonia	..	1
Empyema	..	1
Total	2	6

APPENDIX No. XXX—*continued.*

ABSTRACT No. 11, showing the Ages of the Troops serving in the Mediterranean, and the Deaths at each Age, during the Year 1869.

Station.	Corps.	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
		Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.	Strength on 1st January.	Died.
Gibraltar	Royal Artillery	67	..	60	1	195	1	175	..	65	2	11	1	573	5
	Royal Engineers	7	..	41	..	91	2	83	3	19	..	6	..	247	5
	1st Battalion 13th Foot	92	..	282	..	185	..	118	..	34	1	3	..	714	1
	28th Foot	157	..	251	..	163	2	139	3	29	1	9	..	748	6
	71st „	152	..	211	..	92	..	150	2	37	..	15	..	658	2
	74th „	335	..	194	3	86	1	113	..	25	1	..	..	753	5
	83rd „	111	..	280	..	210	2	66	1	33	..	6	..	706	3
Malta ..	Royal Artillery	62	..	151	..	241	1	194	1	81	4	12	..	741	6
	Royal Engineers	5	..	10	..	52	1	87	..	14	..	6	..	174	1
	1st Battalion 24th Foot	92	..	305	..	125	2	73	2	37	1	8	..	640	5
	31st Foot	138	..	206	1	167	..	138	2	48	..	4	..	701	3
	48th „	184	..	290	2	135	..	95	2	37	3	..	..	741	7
	52nd „	318	..	188	1	80	1	90	1	67	..	1	..	744	3
	64th „	72	..	188	2	210	2	112	2	72	1	16	3	670	10
	87th „	159	..	154	2	110	2	131	4	149	1	1	..	704	9
	Total	1,952	..	2,811	12	2,142	17	1,764	23	747	15	98	4	9,514	71

APPENDIX No. XXX—*continued.*

ABSTRACT No. 12, showing the Admissions into Hospital and Deaths among the Troops serving in the Dominion of Canada and in Bermuda during the Year 1869; and the Number of Invalids sent home from these Colonies, and of Men finally discharged the Service in them and at Netley during the same period.

Stations	Dominion of Canada.		Bermuda.		Invalids.				
Average Annual Strength	9,151		1,986		Sent home from—		Discharged in Canada.	Discharged at Netley from—	
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.		Canada.	Bermuda.
I. *General Diseases.*									
1. Febrile:									
Small Pox	8	..	..	..	..	..	..	..	..
Cowpox	1	..	..	..	..	..	..	..	..
Chicken Pox	1	..	..	..	..	..	..	..	..
Measles	4	..	..	..	..	..	..	..	..
Scarlet Fever	13	1	..	..	..	..	..	..	..
Typhus „	2	..	..	..	..	..	..	..	..
Cerebro-spinal Fever	1	..	..	..	..	..	..	..	..
Enteric Fever	6	1	52	11	..	..	..	..	..
Simple Continued Fever	100	3	38	2	..	..	..	..	..
Febricula	69	..	147	..	..	..	..	..	..
Ague	59	..	3	..	..	..	..	..	..
Remittent Fever	3	..	3	..	..	..	..	..	..
Simple Cholera	1	..	..	..	..	..	..	..	..
Mumps	2	..	1	..	..	..	..	..	..
Influenza	54	..	44	..	..	..	..	..	..
Erysipelas	51	..	1	..	..	..	..	..	..
Pyæmia	..	1	..	..	..	..	..	..	..
2. Constitutional:									
Acute Rheumatism	143	..	27	..	..	2	..	..	..
Gonorrhœal „	1	..	..	..	..	..	..	..	..
Chronic „	147	..	55	..	4	..	..	2	2
Muscular „	29	..	20	..	..	..	..	..	..
Gout	2	..	1	..	1	..	..	..	..
Chronic Osteo-Arthritis	1	..	..	..	1	..	1	..	..
Primary Syphilis	484	..	21	..	..	..	..	..	..
Secondary „	179	..	14	..	17	..	1	7	..
Lupus	..	..	1	..	..	..	..	..	..
Scrofula	13	..	2	..	6	1	..	6	2
Phthisis Pulmonalis	34	7	9	1	22	2	..	28	3
Hæmoptysis (Tub.)	4	..	4	..	1	..	..	..	..
Diabetes	..	..	..	..	..	..	..	1	..
Purpura	4	..	..	..	..	..	..	..	..
Scurvy	1	..	..	..	..	..	..	..	..
Anæmia	6	..	..	..	..	..	..	1	..
General Dropsy	4	..	1	1	..	..	..	..	..
II. *Local Diseases.*									
1. Nervous System:									
Encephalitis	3	1	1	..	..	..	1	..	..
Meningitis	2	1	1	1	..	..	..	..	..
Apoplexy	1	5	..	2	..	..	..	..	..

Abstract No. 12—*continued.*

Stations	Dominion of Canada.		Bermuda.		Invalids.				
Average Annual Strength	9,151		1,986		Sent home from—		Discharged in Canada.	Discharged at Netley from—	
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.		Canada.	Bermuda.
Sunstroke	..	..	2	..	..	..	..	..	..
Paralysis	18	2	3	..	7	2	1	6	1
Epilepsy	14	..	3	1	6	1	..	2	1
Convulsions	1	..	..	..	..	..	..	..	..
Spasm of Muscle	..	..	1	..	..	..	..	..	..
Neuralgia	23	..	8	..	1	..	..	1	..
Anæsthesia	1	..	..	..	..	..	..	..	..
Mania	5	..	..	..	3	..	..	..	..
Dementia	13	..	6	..	5	2	1	..	..
2. Diseases of the Eye:									
Conjunctivitis	91	..	34	..	1	..	..	1	4
Tarsal Ophthalmia	17	..	44	..	..	8	..	..	..
Keratitis	1	..	..	..	..	..	..	..	..
Staphyloma	1	..	..	..	..	..	..	..	1
Sclerotitis	1	..	1	..	..	..	..	..	..
Iritis	6	..	..	..	1	..	..	..	..
Amaurosis	..	..	1	..	..	..	..	..	..
Short Sight	1	..	..	..	4	..	1	4	..
Nyctalopia	..	..	2	..	..	..	..	..	..
3. Diseases of the Ear:									
Inflam. Extl. Meatus	8	..	..	..	..	..	..	..	..
Abscess „ „	2	..	..	..	..	..	..	..	..
Inflam. Membr. Tympani	7	..	14	..	..	1	..	..	1
Deafness	8	..	..	..	3	1	..	2	..
Accumulation of Wax	1	..	..	..	..	..	..	..	..
4. Diseases of the Nose:									
Epistaxis	4	..	1	..	..	..	..	..	..
5. Circulatory System:									
Pericarditis	5	..	1	..	..	..	..	..	..
Endo-carditis	2	1	..	..	..	..	..	..	..
Dropsy of Pericardium	..	..	..	1	..	..	..	..	..
Valve Disease of Heart	26	5	2	..	7	1	1	8	5
Hypertrophy „	5	1	1	..	3	..	..	..	..
Angina Pectoris	1	..	..	..	1	..	..	..	..
Palpitation	5	..	13	..	1	5	..	1	..
Degeneration of Arteries	1	..	..	..	1	..	..	..	..
Aneurism of Aorta	7	9	2	1	2	1	1	2	1
Aneurism	2	..	..	..	..	..	..	..	..
Rupture of Aorta	..	..	..	1	..	..	..	..	..
Varicose Veins	5	..	3	..	1	..	2	1	..
6. Absorbent System:									
Inflam. of Lymphatics	3	..	..	..	..	..	..	..	..
Inflam. of Glands	103	..	9	..	..	..	..	..	..
Suppuration „	22	..	..	..	..	..	..	..	..

Abstract No. 12—*continued.*

Stations	Dominion of Canada.		Bermuda.		Invalids.				
Average Annual Strength	9,151		1,986		Sent home from—		Discharged in Canada.	Discharged at Netley from—	
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.		Canada.	Bermuda.
7. Diseases of Ductless Glands:									
Tumour	1	..	..	..	..	..	..	..	..
8. Respiratory System:									
Laryngitis	1	..	..	..	..	..	..	..	..
Aphonia	1	..	..	..	..	..	..	..	..
Bronchitis	499	3	77	..	17	..	..	1	..
Asthma	13	..	3	..	1	..	..	..	..
Pneumonia	120	9	10	..	3	..	..	..	..
Pulmonary Extravasation.	5	1	..	..	..	..	..	..	..
Emphysema	..	..	..	..	..	..	..	1	..
Pleurisy	23	..	6	..	..	..	..	..	..
Empyema	1	1	..	..	..	..	..	..	..
9. Digestive System:									
Stomatitis	2	..	..	..	..	..	..	..	..
Ulceration of Gums ..	1	..	..	..	..	..	..	..	..
Abscess of Cheek	1	..	..	..	..	..	..	..	..
„ Alveoli ..	2	..	..	..	..	..	..	..	..
Inflammation of Alveoli ..	1	..	..	..	..	..	..	..	..
Tonsillitis	231	..	21	..	..	..	..	1	..
Ulceration of Pharynx ..	..	..	..	..	..	..	..	1	..
Gastritis	4	..	..	..	1	..	..	..	..
Hæmatemesis	1	..	1	..	..	..	..	..	..
Dyspepsia	108	..	97	..	1	..	..	2	1
Enteritis	1	..	1	..	..	..	..	..	..
Dysentery	1	..	77	1	1	..	..	2	1
Diarrhœa	73	..	133	1	..	3	..	..	..
Intestinal Obstruction ..	2	1	..	..	..	..	..	..	..
Hernia	8	..	2	..	3	..	..	4	..
Colic	18	..	10	..	..	..	..	..	..
Tænia Solium	7	..	..	..	..	..	..	..	..
Ascaris Lumbricoides ..	1	..	..	..	..	..	..	..	..
Constipation	12	..	1	..	..	..	..	..	..
Fistula in Ano	13	..	..	..	..	..	..	1	1
Ulcer of Anus	1	..	..	..	..	..	..	..	..
Hæmorrhoids	33	..	13	..	..	2	..	..	..
Condyloma of Anus ..	5	..	..	..	..	..	..	..	..
Hepatitis	13	1	22	1	6	2	..	2	1
Congestion of Liver ..	1	..	..	..	..	..	..	..	..
Cirrhosis	..	..	..	1	..	..	..	..	..
Jaundice	16	..	1	..	..	..	..	..	..
Splenitis	..	..	1	..	..	..	..	..	..
Peritonitis	1	..	1	1	..	..	..	..	..
Ascites	2	1	..	..	..	..	..	..	..
Ulceration of Tongue ..	1	..	..	..	..	..	..	..	..
Quinsy	2	..	..	..	..	..	..	..	..

Abstract No. 12—*continued.*

Stations	Dominion of Canada.		Bermuda.		Invalids.				
Average Annual Strength	9,151		1,986		Sent home from—		Discharged in Canada.	Discharged at Netley from—	
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.		Canada.	Bermuda.
10. Urinary System:									
Urinary Abscess	..	..	..	1	..	..	..	..	..
Bright's Disease	8	2	1	1	5	..	..	3	..
Nephritis	2	1	1	..	..	..	..	..	..
Gonorrhœa	614	..	48	..	..	..	..	..	..
Phymosis, &c.	10	..	..	..	..	..	..	..	..
Bubo	85	..	3	..	..	..	..	..	..
Epididymitis Gon.	20	..	1	..	..	..	..	..	..
Stricture of Urethra	17	1	4	..	1	..	..	2	..
Urinary Fistula	1	..	..	..	..	..	..	..	..
Condyloma	3	..	..	..	..	..	..	..	..
Cystitis	2	1	..	..	1	..	..	..	..
Incontinence of Urine	1	..	..	..	..	..	..	1	..
Retention „	2	..	..	..	..	..	..	..	..
Extravasation „	..	..	1	..	..	..	..	..	..
Diuresis	3	..	..	..	1	..	..	..	..
Hæmaturia	2	..	..	..	..	..	..	..	..
Inflam: of Urethra	1	..	..	..	..	..	..	..	..
11. Generative System:									
Varicocele	15	..	1	..	..	..	..	..	..
Hydrocele	87	..	2	..	..	..	..	..	..
Orchitis	..	..	24	..	..	1	..	1	1
Hæmatocele	1	..	..	..	..	..	..	..	..
Abscess of Testicle	1	..	..	..	..	..	..	..	..
12. Organs of Locomotion:									
Ostitis	10	..	1	..	..	..	..	..	..
Caries	1	..	..	..	..	..	..	..	1
Necrosis	2	..	..	..	..	..	..	..	..
Synovitis	14	..	..	..	..	..	..	..	..
Dropsy of Joint	..	..	..	..	1	..	..	..	..
Club Foot	..	..	..	..	..	..	..	1	..
Enlarged Bursa Patellæ	1	..	..	..	..	..	..	..	..
Contraction	..	..	..	..	..	..	..	3	2
Abscess of Muscle	2	..	..	..	..	..	..	..	..
Flatfeet	..	..	..	..	1	..	..	..	1
Hypertrophy of Tibia	1	..	..	..	..	..	..	..	..
Bursal Abscess	1	..	..	..	..	..	..	..	..
Palmar „	2	..	..	..	..	..	..	..	..
Psoas „	..	..	..	..	..	..	..	1	..
Bunion	..	..	1	..	..	..	..	..	..
13. Diseases of Cellular Tissue:									
Inflam: of Cellular Tissue	25	..	5	..	1	..	..	..	..
Abscess „ „	171	1	35	1	3	2	..	1	..
14. Cutaneous System:									
Urticaria	7	..	..	..	..	..	..	..	..
Lichen	2	..	5	..	..	..	..	..	..

Abstract No. 12—*continued.*

Stations	Dominion of Canada.		Bermuda.		Invalids.				
					Sent home from—			Discharged at Netley from—	
Average Annual Strength	9,151		1,986						
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.	Discharged in Canada.	Canada.	Bermuda.
Psoriasis	15	..	2	..	..	..	..	..	..
Herpes	20	..	2	..	..	..	..	..	..
Eczema	36	..	20	..	..	..	..	..	..
Impetigo	..	..	1	..	..	..	..	..	..
Roseola	1	..	..	..	..	..	..	..	..
Pemphigus	..	..	1	..	..	..	..	..	..
Corn	..	..	1	..	..	..	..	..	..
Ecthyma	..	..	1	..	..	..	..	..	..
Intertrigo	..	..	1	..	..	..	..	..	..
Ulcer	156	..	92	..	1	..	..	1	..
Boil	85	..	69	..	..	..	..	..	..
Carbuncle	5	..	1	..	..	..	..	..	..
Whitlow	20	..	14	..	..	..	..	..	..
Itch	35	..	3	..	..	..	..	..	..
Warts	9	..	1	..	..	..	..	..	..
Sebaceous Tumour	1	..	..	..	..	..	..	..	..
Rupia	1	..	..	..	..	..	..	..	..
Tinea	7	..	3	..	..	..	..	..	..
Fatty Tumour	1	..	1	..	..	..	..	..	..
Cartilaginous Tumour	1	..	..	..	1	..	..	..	..
Erythema	4	..	..	..	..	..	..	..	..
Miliaria	2	..	..	..	..	..	..	..	..
Mentagra	5	..	..	..	..	..	..	..	..
Ingrown Toenail	1	..	..	..	..	..	..	..	..
Frost Bite	9	..	..	..	1	..	..	1	..
Sting of Insect	..	..	1	..	..	..	..	..	..
Tumour	1	..	..	..	..	..	..	..	..
III. *Conditions, &c.*									
General Debility	23	..	19	..	15	3	2	4	2
IV. *Poisons.*									
Delirium Tremens	81	2	70	1	..	..	..	..	..
Poisoned Wound	1	..	..	..	..	..	..	..	..
Cat Bite	1	..	..	..	..	..	..	..	..
V. *Injuries.*									
2. Accidental:									
Burns and Scalds	44	..	11	..	..	..	..	..	..
Asphyxia by Drowning	1	5	..	1	..	..	..	..	..
Exposure to Cold	1	..	..	..	..	..	..	..	..
Contusion	305	..	125	..	1	..	..	..	..
Concussion of the Brain	2	..	..	..	..	..	..	..	..
Fracture	27	..	17	..	3	3	1	4	1
Wounds	100	..	55	..	..	..	..	..	..
,, from Gunshot	5	..	..	..	..	..	..	..	..
Sprain	146	..	56	..	..	1	..	..	..
Dislocation	15	..	..	..	..	..	..	..	..

Abstract No. 12—*continued.*

Stations	Dominion of Canada.		Bermuda.		Invalids.				
					Sent home from—			Discharged at Netley from—	
Average Annual Strength	9,151		1,986				Discharged in Canada.		
Diseases.	Admitted.	Died.	Admitted.	Died.	Canada.	Bermuda.		Canada.	Bermuda.
Blisters of the Feet	13	..	..	..	..	..	..	..	..
Injury to Spinal Cord	1	..	..	..	..	..	..	..	..
Suffocation	..	1	..	..	..	..	..	..	..
Rupture of Tendons	..	..	..	..	..	..	..	2	..
3. Homicidal:									
Fracture of Skull	..	1	..	..	..	..	..	..	..
4. Self-inflicted:									
Asphyxia by Drowning	..	..	..	1	..	..	..	..	..
Cut throat	2	1	..	..	..	..	..	..	..
Gunshot	..	1	1	4	..	..	..	..	..
Poison	..	2	..	..	..	..	..	..	..
VI. *Surgical Operations.*									
Amputation of Finger	3	..	..	..	..	..	..	..	..
„ Forearm	1	..	..	..	1	..	..	1	..
„ Hand	6	..	..	..	..	..	..	1	..
Total	5,376	74	1,775	37	169	44	13	115	33

Causes of the Deaths of the Invalids.

Diseases.	Dominion of Canada.	Bermuda.
Cancer of Rectum	1	..
Phthisis Pulmonalis	3	1
Diabetes	1	..
Lumbar Abscess	1	..
Total	6	1

APPENDIX No. XXX—*continued.*

ABSTRACT No. 13, showing the Ages of the Troops serving in the Dominion of Canada, and the Deaths at each Age, during the Year 1869.

Corps.	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.
Royal Artillery	46	..	172	1	329	4	278	4	133	2	23	1	981	12
Royal Engineers	6	..	55	..	87	1	45	1	24	..	4	..	221	2
1st Bn. 16th Foot	141	..	221	2	246	..	97	..	26	..	..	..	731	2
29th Foot	64	..	272	1	240	..	74	..	49	1	4	..	703	2
1st Bn. 60th Foot	86	..	229	1	280	..	89	2	25	1	2	..	711	4
69th Foot	114	..	349	2	155	..	100	..	26	..	10	..	754	2
78th „	106	..	305	1	280	5	72	..	13	..	2	..	778	6
1st Bn. Rifle Brigade	71	..	288	1	223	..	126	1	30	..	1	..	739	2
Royal Canadian Rifles	54	..	26	..	106	2	477	5	386	7	141	3	1,190	17
Total	688	..	1,917	9	1,946	12	1,358	13	712	11	187	4	6,808	49

APPENDIX No. XXX—*continued.*

Abstract No. 14.

ABSTRACT showing the Ages of the Troops serving in Bermuda, and the Deaths at each Age, during the year 1869.

Corps.	Under 20.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.
Royal Artillery	4	..	27	..	140	1	26	1	3	..	..	..	200	2
1st Bn. 15th Regiment	15	1	280	8	268	4	114	4	33	1	31	..	741	18
61st Regiment	165	..	229	1	315	6	87	..	48	2	6	..	750	9
Total	184	1	536	9	723	11	227	5	84	3	37	..	1,691	29

APPENDIX No. XXX—*continued.*

ABSTRACT No. 15, showing the Admissions into Hospital and Deaths among the White Troops serving in the Windward and Leeward Command and Jamaica, in the Year 1869; the disabilities of the Invalids sent home, and of those Discharged the Service at Netley during the same period.

Stations	Windward and Leeward Command.		Jamaica.		Invalids.			
					Sent Home from		Discharged at the Invalid Depôt from	
Strength	884		825					
Diseases.	Admitted.	Died.	Admitted.	Died.	West Indies.	Jamaica.	West Indies.	Jamaica.
I. *General Diseases.*								
1. Febrile:								
Simple Continued Fever ..	126	..	10	..	..	..	..	..
Febricula	2	..	23	..	..	..	..	..
Yellow Fever	18	1	14	11	..	..	..	..
Ague	11	..	6	..	..	..	..	..
Remittent Fever	113	..	48	1	..	..	..	..
Influenza	2	..	..	..	..	..	..	..
Erysipelas	1	..	1	..	..	..	..	..
2. Constitutional:								
Acute Rheumatism ..	7	..	3	..	..	..	..	..
Chronic „ ..	5	..	3	..	..	..	..	1
Muscular „ ..	..	..	1	..	..	..	..	..
Primary Syphilis	87	..	21	..	..	..	..	..
Secondary „	12	..	16	..	1	1	..	..
Cancer	3	..	..	..	..	..	..	..
Scrofula	1	..	1	..	..	..	..	..
Phthisis Pulmonalis ..	13	1	2	1	4	1	3	..
Hæmoptysis	3	..	..	..	1	..	..	..
Diabetes	1	..	..	..	1	..	1	..
Anæmia	4	..	..	..	..	..	..	..
General Dropsy	..	..	2	..	..	..	..	..
II. *Local Diseases.*								
1. Of the Nervous Sys.:								
Apoplexy	5	1	1	1	1	..	..	..
Paralysis	..	..	..	..	..	..	1	..
Epilepsy	2	..	3	..	..	1	..	..
Hysteria	1	..	..	..	..	..	..	..
Neuralgia	..	..	4	..	..	..	..	..
Mania	2	..	..	..	1	..	..	..
Dementia	2	..	..	..	1	1	..	..
2. Of the Eye:								
Conjunctivitis	25	..	3	..	..	..	..	..
Tarsal Ophthalmia	..	..	1	..	..	..	..	..
Iritis	..	..	1	..	..	..	..	..
Hordeolum	1	..	..	..	..	..	..	..
Cyst of Lids	1	..	..	..	..	..	..	..
3. Of the Ear:								
Inflam. Ext. Meatus ..	3	..	..	..	..	..	..	..
„ Membr. Tympani ..	15	..	..	..	..	..	..	..
Deafness	1	..	..	..	..	..	..	..
4. Of the Nose:								
Epistaxis	2	..	1	..	..	..	..	..

Abstract No. 15—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Invalids.			
					Sent Home from		Discharged at the Invalid Depôt from	
Strength	884		825					
Diseases.	Admitted.	Died.	Admitted.	Died.	West Indies.	Jamaica.	West Indies.	Jamaica.
5. Circulatory System:								
Valve Disease of Heart	2	..	..	..	1	..	1	2
Fatty Degeneration of Heart	1	..	..	..	1	..	1	..
Palpitation	..	..	12	..	..	3	..	..
Aneurism of Aorta	..	..	1	1	..	..	..	..
Varicose Veins	2	..	..	..	1	..	..	..
6. Absorbent System:								
Inflammation of Glands	16	..	8	..	..	..	..	..
Suppuration „	1	..	4	..	..	..	..	..
8. Respiratory System:								
Bronchitis	26	..	20	..	1	1	..	1
Pneumonia	..	..	1	..	..	1	..	..
9. Digestive System:								
Stomatitis	..	..	2	..	..	..	..	..
Thrush	1	..	..	..	..	..	..	..
Abscess of Antrum	1	..	..	..	..	..	..	..
Ulcerated Throat	..	..	6	..	..	..	..	..
Tonsillitis	7	..	4	..	..	..	..	..
Hæmatemesis	1	..	..	..	..	..	..	..
Dyspepsia	16	..	2	..	..	..	..	1
Dysentery	1	..	5	..	..	..	..	..
Diarrhœa	24	..	18	..	..	..	..	..
Hernia	..	..	1	..	..	..	..	..
Colic	17	..	5	..	..	..	..	..
Tænia Solium	..	..	2	..	..	..	..	..
Ascaris Lumbricoides	..	..	1	..	..	..	..	..
Hæmorrhoids	4	..	3	..	..	..	..	..
Condyloma of Anus	1	..	1	..	..	..	..	..
Hepatitis	2	..	4	..	..	..	..	..
Congestion of Liver	1	..	..	..	..	..	..	..
Jaundice	2	..	4	..	..	..	..	..
Peritonitis	1	1	..	..	..	..	..	..
10. Urinary System:								
Bright's Disease	..	..	1	..	..	..	..	..
Suppression of Urine	..	..	1	1	..	..	..	..
Cystitis	..	..	1	..	..	..	..	..
Retention of Urine	1	..	..	..	..	..	..	..
Gonorrhœa	93	..	42	..	..	..	..	..
Phimosis, &c.	1	..	..	..	..	..	..	..
Bubo	9	..	1	..	..	..	..	..
Abscess of Spermatic Cord	1	..	..	..	..	..	..	..
Epididymitis Gon	8	..	..	..	..	..	..	..
Stricture of Urethra	3	..	1	..	..	..	..	..
11. Generative System:								
Hæmatocele	1	..	..	..	..	..	..	..
Orchitis	3	..	9	..	..	..	..	..
Abscess of Testis	2	..	..	..	..	..	..	..

Abstract No. 15—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Invalids.			
					Sent Home from		Discharged at the Invalid Depôt from	
Strength	884		825					
Diseases.	Admitted.	Died.	Admitted.	Died.	West Indies.	Jamaica.	West Indies.	Jamaica.
12. Organs of Locomotion:								
Ostitis	..	..	1	..	..	..	..	..
Acute Synovitis	1	..	5	..	..	1	..	..
Enlarged Bursa Patellæ ..	1	..	..	..	..	..	..	..
13. Of Cellular Tissue:								
Inflam. of Cellular Tissue ..	1	..	..	..	..	..	..	..
Abscess	16	..	7	..	..	..	..	..
14. Cutaneous System:								
Urticaria	2	..	..	..	..	..	..	..
Lichen	3	..	..	..	..	..	..	..
Psoriasis	2	..	2	..	..	..	..	..
Herpes	1	..	1	..	..	..	..	..
Impetigo	1	..	..	..	..	..	..	..
Rupia	1	..	3	..	..	..	..	..
Ecthyma	3	..	..	..	..	..	..	..
Sycosis	1	..	..	..	..	..	..	..
Ulcer	35	..	15	..	..	3	..	1
Boil	21	..	7	..	..	..	..	..
Whitlow	3	..	9	..	..	..	..	..
Warts	6	..	6	..	..	..	..	..
Itch	1	..	..	..	..	..	..	..
Chigoe	1	..	..	..	..	..	..	..
Tinea	2	..	..	..	..	..	..	..
III. *Conditions, &c.*								
General Debility	..	..	2	..	..	2	..	2
IV. *Poisons.*								
Delirium Tremens	15	..	11	..	..	..	..	..
Alcohol	8	..	15	1	..	..	..	..
V. *Injuries.*								
2. Accidental:								
Burns and Scalds	..	..	1	..	..	..	..	..
Contusion	42	..	34	..	1	..	..	..
Fracture	9	..	4	..	2	..	1	..
Wounds	28	..	32	..	..	..	..	..
Sprain	25	..	25	..	..	..	..	..
Dislocation	..	..	1	..	..	1	..	1
Blisters of the Feet ..	1	..	2	..	..	..	..	..
Rupture of Liver	..	..	1	1	..	..	..	..
4. Self-inflicted								
Gun-shot	1	..	..	..	..	..	..	..
VI. *Surgical Operations.*								
Amput: at Shoulder-Joint	1	..	..	..	..	..	..	..
Excision of Elbow-Joint ..	..	..	..	..	..	..	..	2
No appreciable Disease ..	1	..	..	..	..	..	..	..
Total	946	4	511	18	17	16	8	11

Abstract No. 15—*continued.*

CAUSES of Deaths of the Invalids.

	Jamaica.	Windward and Leeward Command.
Phthisis Pulmonalis	1	1

APPENDIX No. XXX—*continued.*

ABSTRACT No. 16, showing the Admissions into Hospital and Deaths among the Black Troops serving in the Windward and Leeward Command, Jamaica, Honduras, and Bahamas, in the Year 1869, and the Disabilities of those Discharged the Service as Invalids during the same period, in the West Indies and Western Africa.

Stations	Windward and Leeward Command.		Jamaica.		Honduras.		Bahamas.		Black Troops in West Indies and W. Africa.
Average Strength	453		876		180		319		2,652
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Discharged as Invalids.
I. *General Diseases.*									
1. Febrile:									
Chicken Pox	..	..	1	..	..	..	..	..	..
Enteric Fever	..	..	1	..	..	..	..	..	..
Simple Continued Fever	3	..	76	..	..	..	2	..	..
Febricula	..	..	4	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	4	1	..
Ague	19	..	14	..	7	..	53	..	..
Remittent Fever	1	..	5	2	19	1	106	2	..
Influenza	5	..	..	..	..	..	..	..	..
Erysipelas	..	..	1	..	..	..	1	..	..
2. Constitutional:									
Acute Rheumatism	6	..	28	..	..	..	7	..	..
Chronic „	13	..	24	..	13	..	1	..	2
Muscular „	7	..	1	..	1	..	..	..	..
Primary Syphilis	123	..	119	..	2	..	32	..	1
Secondary	9	..	17	..	3	..	8	..	2
Cancer	..	..	1	..	..	..	..	..	1
Scrofula	3	..	15	..	..	..	2	..	4
Phthisis Pulmonalis	6	3	14	10	4	1	7	5	6
Hæmoptysis	..	..	2	..	1	..	1	..	..
Anæmia	1	..	2	..	..	..	..	..	..
II. *Local Diseases.*									
1. Of the Nervous System:									
Meningitis	1	..	..	..	..	..	..	..	..
Apoplexy	1	1	1	1	..	..	..	..	..
Paralysis	..	..	..	..	..	..	1	..	..
Epilepsy	2	..	3	..	..	..	2	..	3
Convulsions	..	..	1	..	..	..	..	..	..
Neuralgia	6	..	3	..	3	..	3	..	..
Mania	2	..	2	..	..	..	1	..	2
Dementia	..	..	4	..	..	..	..	..	1
2. Of the Eye:									
Conjunctivitis	4	..	15	..	3	..	1	..	2
Keratitis	..	..	..	..	1	..	..	..	..
Cataract	..	..	1	..	..	..	..	..	..
Tarsal Ophthalmia	..	..	..	..	1	..	..	..	..
Lachrymal Obstructions	..	..	1	..	..	..	..	..	..
Cyst of Eyelid	..	..	..	..	..	..	1	..	..

Abstract No. 16—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Honduras.		Bahamas.		Black Troops in West Indies and W. Africa.
Average Strength	453		876		180		319		2,652
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Discharged as Invalids.
3. Of the Ear:									
Inflam: External Meatus	..	..	..	..	1	..	..	..	..
5. Circulatory System:									
Valve Disease of Heart	1	..	3	..	3	1	..	..	1
Hypertrophy „	..	..	2	..	..	..	..	..	..
Palpitation „	..	..	1	..	..	..	..	..	..
Varicose Veins	..	..	1	..	..	..	..	..	..
6. Absorbent System:									
Inflam: of Glands	3	..	13	..	..	..	1	..	..
Suppuration „	..	..	5	..	..	..	..	..	..
Tumour „	..	..	3	..	..	..	..	..	..
8. Respiratory System:									
Laryngitis	..	..	..	..	1	1	..	..	..
Bronchitis	5	..	44	..	4	..	21	..	..
Asthma	..	..	7	..	1	..	..	..	..
Pneumonia	..	..	..	..	..	..	..	1	..
Emphysema	..	..	..	..	1	..	1	..	..
Pleurisy	2	..	2	..	1	..	2	..	..
Pneumothorax	..	..	..	..	1	..	..	..	..
9. Digestive System:									
Ulceration of Gum	..	..	..	..	..	..	1	..	..
Inflam. of Alveoli	..	..	1	..	..	..	..	..	..
Tonsillitis	6	..	7	..	..	..	4	..	..
Gastritis	..	..	1	..	..	..	..	..	..
Hæmatemesis	..	..	1	..	1	..	..	..	..
Dyspepsia	..	..	8	..	1	..	1	..	..
Dysentery	2	..	5	..	2	1	..	..	..
Fæcal Abscess	..	..	..	..	..	..	1	1	..
Diarrhœa	2	..	9	..	1	..	2	..	..
Hernia	..	..	12	..	..	..	1	..	..
Colic	4	..	6	..	1	..	5	..	..
Tænia Solium	1	..	2	..	..	..	1	..	..
Constipation	1	..	2	..	..	..	..	..	..
Hæmorrhoids	1	..	..	..	..	..	..	..	..
Hepatitis	..	..	1	..	3	..	..	..	..
Congestion of Liver	1	..	..	..	1	..	..	..	..
Jaundice	..	..	..	..	1	..	2	..	..
Splenitis	..	..	..	..	3	..	..	..	..
Hypertrophy of Spleen	..	..	1	..	..	..	..	..	..
Ascites	..	..	2	..	1	..	2	..	..
10. Urinary System:									
Bright's Disease	2	..	1	1	..	..	..	..	..
Cystitis	1	..	..	..	..	..	..	..	..
Hæmaturia	..	..	2	..	..	..	1	..	..

Appendix No. 16—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Honduras.		Bahamas.		Black Troops in West Indies and W. Africa.
Average Strength	453		876		180		319		2,652
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Discharged as Invalids.
Nephritis	..	..	2	..	..	..	..	..	..
Gonorrhœa	52	..	101	..	9	..	44	..	..
Phimosis, &c.	..	..	..	..	..	..	2	..	..
Bubo	4	..	10	..	..	..	1	..	..
Epididymitis Gon.	1	..	..	..	..	..	3	..	..
Stricture of Urethra	1	..	3	..	2	..	2	..	..
Hæmorrhage of Urethra	..	..	..	..	1	..	..	..	..
11. Generative System:									
Varicocele	..	..	1	..	..	..	..	..	..
Hydrocele	..	..	1	..	..	..	..	..	..
Orchitis	8	..	1	..	4	..	7	..	..
12. Organs of Locomotion:									
Ostitis	2	..	4	..	2	..	..	..	..
Caries	..	..	2	..	..	..	..	..	1
Necrosis	1	..	..	..	..	..	..	..	2
Acute Synovitis	2	..	4	..	..	..	1	..	..
Dropsy of Joint	..	..	3	..	..	..	..	..	..
Contraction	..	..	..	..	..	..	..	..	1
Bursal Abscess	..	..	..	..	1	..	..	..	..
13. Of Cellular Tissue:									
Inflam: of Cellular Tissue	6	..	..	..	..	..	..	..	..
Abscess " "	..	..	13	..	6	..	3	..	..
Fatty Tumour	..	..	..	..	..	..	1	..	..
14. Cutaneous System:									
Psoriasis	1	..	1	..	..	..	..	..	..
Herpes	..	..	1	..	2	..	..	..	..
Eczema	1	..	..	..	..	..	..	..	..
Ulcer	15	..	52	..	8	..	6	..	..
Boil	15	..	17	..	1	..	4	..	..
Whitlow	..	..	7	..	2	..	1	..	..
Warts	2	..	..	..	..	..	1	..	..
Itch	1	..	..	..	..	..	..	..	..
III. *Conditions, &c.*									
General Debility	1	..	1	..	..	..	2	..	..
Old Age	..	..	..	..	1	..	..	..	2
IV. *Poisons, &c.*									
Delirium Tremens	..	..	..	..	..	..	1	..	..
Alcohol	..	..	..	..	..	..	3	..	..
V. *Injuries.*									
2. Accidental:									
Burns and Scalds	..	..	1	..	..	..	..	..	..
Contusion	23	..	33	..	10	..	4	1	..

Abstract No. 16—*continued.*

Stations	Windward and Leeward Command.		Jamaica.		Honduras.		Bahamas.		Black Troops in West Indies and W. Africa.
Average Strength	453		876		180		319		2,652
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Discharged as Invalids.
Fracture	..	..	3	..	1	..	..	..	..
Wounds	20	..	26	..	6	..	16	..	..
,, from Gunshot	..	..	..	..	..	..	..	..	1
Sprain	4	..	2	..	5	..	7	..	..
Dislocation	1	..	..	..	..	..	..	..	..
Blisters of the Feet	9	..	..	..	..	..	4	..	..
4. Self-inflicted: Gunshot Wound	..	..	..	1	..	..	..	..	..
VI. *Surgical Operations.* Amputation of Penis	..	..	1	..	..	..	..	..	..
Total	414	4	788	15	146	5	392	11	32

APPENDIX No. XXX—*continued.*

ABSTRACT No. 17, showing the Admissions into Hospital and Deaths among the Black Troops serving in Western Africa, during the Year 1869.

Stations	Sierra Leone.		Gambia.		Gold Coast.		Lagos.	
Strength	330		138		285		71	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
I. *General Diseases.*								
1. Febrile:								
Simple Continued Fever	4	..	..	..	..	..	..	..
Febricula	..	..	..	..	..	..	4	..
Ague	2	..	..	..	13	..	4	..
Remittent Fever	25	..	..	..	11	1	14	..
Malignant Cholera	..	..	21	14	..	..	..	..
2. Constitutional:								
Acute Rheumatism	9	..	3	..	8	..	5	..
Chronic „	20	..	7	..	20	..	3	..
Muscular „	..	..	..	..	8	..	1	..
Primary Syphilis	92	..	8	..	13	..	6	..
Secondary „	12	..	..	..	..	..	3	..
Scrofula	6	..	..	..	..	..	..	..
Phthisis Pulmonalis	7	3	..	1	1	1	..	..
Hæmoptysis	3	1	..	..	..	..	..	..
Anæmia	1	..	..	..	..	..	..	..
II. *Local Diseases.*								
1. Of the Nervous System:								
Paralysis	1	..	..	..	1	..	2	..
Tetanus	..	..	1	1	..	..	..	..
Epilepsy	1	..	..	..	..	..	..	..
Neuralgia	1	..	..	..	..	..	1	..
2. Of the Eye:								
Conjunctivitis	2	..	..	..	5	..	1	..
Tarsal Ophthalmia	..	..	5	..	1	..	..	..
Impaired Vision	..	..	..	..	1	..	..	..
3. Of the Ear:								
Inflam: Membr: Tympani	..	..	..	..	1	..	..	..
5. Circulatory System:								
Valve Disease of Heart	..	..	..	..	1	..	1	..
Endocarditis	..	..	1	..	..	..	..	..
6. Absorbent System:								
Inflam: of Glands	2	..	..	..	10	..	..	..
„ Lymphatics	1	..	..	..	..	..	..	..
8. Respiratory System:								
Bronchitis	11	..	6	..	4	..	3	1
Asthma	3	..	2	..	..	..	..	..
Pneumonia	7	..	4	1	1	..	..	..
Abscess of Lung	1	1	..	..	..	..	..	..
Pleurisy	3	..	2	..	1	..	..	..

Abstract No. 17—*continued.*

Stations	Sierra Leone.		Gambia.		Gold Coast.		Lagos.	
Strength	330		138		285		71	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
4. Digestive System:								
Hæmatemesis	1	..	..	..	..	..	..	..
Gum Boils	1	..	..	..	..	..	..	..
Inflam: of Gums	1	..	..	..	1	..	..	..
Tonsillitis	5	..	..	..	..	..	..	..
Pharyngitis	1	..	..	..	..	..	..	..
Dyspepsia	..	..	1	..	1	..	..	..
Ulceration of Intestines	..	..	1	1	..	..	..	..
Dysentery	8	..	2	1	19	1	4	1
Diarrhœa	14	..	2	..	4	..	4	..
Hernia	2	..	1	..	3	..	..	..
Colic	3	..	2	..	2	..	2	..
Tænia Solium	3	..	..	..	..	..	..	..
Ascaris Lumbricoides	1	..	..	..	..	..	..	..
Hæmorrhoids	2	..	3	..	..	..	..	..
Hepatitis	1	..	..	..	2	..	..	..
Abscess of Liver	1	1	..	..	..	..	..	..
Jaundice	..	..	..	..	1	..	..	..
Splenitis	4	..	..	..	2	..	..	..
Congestion of Spleen	..	..	..	..	1	..	..	..
Peritonitis	..	..	..	..	1	1	..	..
5. Urinary System:								
Calculus	..	..	1	..	..	..	..	..
Bright's Disease	2	2	..	..	1	..	..	..
Nephritis	..	..	..	..	..	..	1	1
Hæmaturia	2	..	..	..	..	..	..	..
Gonorrhœa	43	..	13	..	18	..	4	..
Bubo	..	..	2	..	4	..	..	..
Epididymitis	..	..	1	..	..	..	..	..
Stricture of Urethra	..	..	..	..	2	..	..	..
11. Generative System:								
Hydrocele	1	..	..	..	1	..	..	..
Orchitis	4	..	..	..	1	..	1	..
12. Organs of Locomotion:								
Ostitis	5	..	..	..	..	..	..	..
Necrosis	..	..	..	..	..	1	..	..
Acute Synovitis	4	..	1	..	1	..	1	..
Ulceration of Cartilage	1	..	..	..	..	..	..	..
Bunion	..	..	..	..	1	..	..	..
13. Of Cellular Tissue:								
Inflammation of Cellular Tissue	..	..	..	..	1	1	1	..
Abscess " "	8	..	3	..	12	..	5	..
Guinea Worm	..	..	..	..	28	1	..	..
14. Cutaneous System:								
Lichen	2	..	..	..	..	..	..	..
Psoriasis	..	..	..	..	1	..	..	..
Herpes	6	..	..	..	2	..	..	..

Abstract No. 17—*continued.*

Stations	Sierra Leone.		Gambia.		Gold Coast.		Lagos.	
Strength	330		138		285		71	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Eczema	..	..	1	..	2	..	..	..
Impetigo	1	..	..	..	..	..	..	..
Ulcer	29	..	11	..	25	..	4	..
Boil	5	..	1	..	6	..	10	..
Whitlow	1	..	..	..	..	..	3	..
Itch	1	..	..	..	..	..	1	..
Yaws	..	..	..	..	1	..	..	..
Acne	..	..	..	..	..	..	1	..
III. *Conditions, &c.*								
General Debility	3	..	..	..	..	..	..	..
IV. *Poisons.*								
Delirium Tremens	1	..	..	..	..	..	..	..
V. *Injuries.*								
2. Accidental:								
Burns and Scalds	..	..	1	..	..	..	..	..
Asphyxia by Drowning	..	1	..	..	..	..	..	..
Contusion	20	..	3	..	9	1	4	..
Fracture	4	..	..	..	1	..	..	..
Wounds	16	..	7	..	13	..	1	..
„ from Gunshot	1	..	..	..	..	..	..	..
Sprain	..	..	..	..	5	..	1	..
Disease not stated	5	..	..	..	..	..	..	..
Total	427	9	117	19	272	8	101	3

APPENDIX No. XXX—*continued.*

ABSTRACT No. 18, showing the Admissions into Hospital, and Deaths, among the Troops serving at the Cape of Good Hope and St. Helena, Mauritius, Ceylon and the Straits Settlements, in the year 1869.

Stations..	Cape and St. Helena.		Mauritius.		Ceylon.				Straits Settlements.	
					White.		Black.			
Strength	4,447		589		906		943		541	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
I. *General Diseases.*										
1. Febrile:										
Small Pox	..	..	..	..	..	..	2	..	2	..
Chicken Pox	..	..	..	..	..	..	7	..	..	..
Measles	1	..	..	..	..	..	..	..	..	..
Scarlet Fever	2	..	..	..	..	..	..	..	..	..
Enteric „	4	..	..	..	1	1	..	..	..	..
Simple continued Fever	175	..	5	..	30	1	..	..	7	..
Febricula	110	..	3	..	14	..	..	..	55	..
Ague	99	..	513	..	118	..	71	1	49	..
Remittent Fever	8	1	207	2	81	1	28	..	5	..
Simple Cholera	1	..	1	1	..	..	..	..	..	..
Influenza	48	..	4	..	2	..	..	..	..	..
Erysipelas	17	1	2	..	..	..	1	..	1	..
Mumps	..	..	..	..	..	..	1	..	..	..
2. Constitutional:										
Acute Rheumatism	91	1	7	..	10	..	20	..	4	..
Synovial „	1	..	..	..	..	..	..	..	..	..
Gonorrhœal Rheumatism	1	..	..	..	..	..	..	..	2	..
Chronic Rheumatism	97	..	8	..	5	..	7	..	5	..
Muscular „	6	..	5	..	3	..	..	..	7	..
Gout	2	..	..	..	..	..	..	..	..	..
Primary Syphilis	470	..	8	..	41	..	10	..	37	..
Secondary „	270	1	27	..	23	..	6	..	4	..
Cancer	1	..	..	..	2	1	..	..	..	..
Lupus	..	..	..	..	5	..	..	..	..	..
Scrofula	9	1	2	..	1	..	1	..	..	..
Morbus Coxarius	1	..	..	..	..	..	..	..	..	..
Phthisis Pulmonalis	35	6	7	..	26	2	3	2	4	1
Hæmoptysis (Tubercular)	..	..	1	..	..	..	..	..	1	..
Purpura	..	..	..	..	1	..	..	..	..	..
Anæmia	3	..	15	..	8	..	..	..	..	..
General Dropsy	..	..	..	..	..	..	..	..	2	..
II. *Local Diseases.*										
1. Diseases of the Nervous System:										
Encephalitis	7	..	..	..	..	..	..	..	..	..
Meningitis	..	..	..	..	..	..	..	..	2	..
Apoplexy	4	3	..	..	..	1	2	1	1	..

Abstract No. 18—*continued.*

Stations..	Cape and St. Helena.		Mauritius.		Ceylon.				Straits Settlements.	
					White.		Black.			
Strength	4,447		589		906		943		541	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Paralysis	9	3	..	..	..	..	2	..	..	..
Sunstroke	1	..	1	..	..	..	..	..	..	..
White softening of Brain	1	..	..	..	1	1	..	..	..	..
Epilepsy	17	1	2	..	1	..	..	..	..	..
Neuralgia	12	..	3	..	4	..	..	..	5	..
Mania	2	..	..	..	..	..	..	..	..	..
Dementia	6	..	..	..	..	..	..	..	..	..
2. Diseases of the Eye:										
Conjunctivitis	126	..	7	..	25	..	41	..	3	..
Tarsal Ophthalmia	80	..	1	..	16	..	6	..	2	..
Iritis	2	..	1	..	..	..	..	..	1	..
Sclerotitis	..	..	..	..	..	..	1	..	..	..
Abscess of Lachrymal Apparatus ..	..	..	..	..	1	..	..	..	..	..
Loss of Eyelashes	..	..	..	..	1	..	..	..	..	..
Hemeralopia	..	..	..	..	2	..	..	..	..	..
Pterygium	1	..	..	..	..	..	..	..	..	..
Keratitis	6	..	..	..	..	..	..	..	..	..
Amaurosis	1	..	..	..	..	..	..	..	1	..
Inflammation of Eyelids	3	..	..	..	..	..	..	..	..	..
Entropium	1	..	..	..	..	..	..	..	..	..
3. Diseases of the Ear:										
Inflamm : Membr : Tympani.. ..	9	..	..	..	1	..	1	..	5	..
Deafness	3	..	..	..	2	..	..	..	..	..
Abscess..	..	..	1	..	5	..	..	..	..	..
Inflamm : Ext : Meatus	1	..	3	..	11	..	..	..	1	..
Hæmatoma Auris	..	..	..	..	..	..	..	..	1	..
5. Circulatory System:										
Endocarditis	..	..	..	..	..	..	..	..	1	..
Valve Disease of Heart	19	..	3	1	2	..	5	1	..	..
Hypertrophy „	12	1	4	..	4	..	..	..	2	..
Fatty Degeneration of Heart	..	..	..	..	1	1	..	..	..	..
Dilatation of Heart	..	..	..	..	1	..	..	..	..	..
Palpitation	4	..	1	..	8	..	..	..	5	..
Aneurism of Aorta	3	3	..	..	..	1	..	..	..	..
Varicose Veins..	1	..	..	..	..	..	..	..	..	..
6. Absorbent System:										
Inflamm. of Glands	40	..	1	..	24	..	6	..	4	..
Suppuration „	17	..	..	..	3	..	..	..	1	..
Hypertrophy „	..	..	2	..	..	..	..	..	..	..
Inflamm : of Lymphatics	..	..	..	..	1	..	..	..	..	..
8. Respiratory System:										
Coryza	..	..	1	..	..	..	..	..	..	..
Laryngitis	..	..	1	..	..	..	..	..	..	..
Bronchitis	158	1	33	1	25	..	37	3	17	..
Asthma..	6	..	2	..	..	..	..	..	1	..
Pneumonia	20	2	..	..	2	..	3	1	..	..
Pulmonary Extravasation	3	..	..	..	..	..	1	..	..	..
Abscess of Lung	1	..	..	..	..	..	..	..	..	..
Pleurisy	6	..	2	..	5	..	1	..	4	..

Abstract No. 18—*continued.*

Stations..	Cape and St. Helena.		Mauritius.		Ceylon. White.		Ceylon. Black.		Straits Settlements.	
Strength	4,447		589		906		943		541	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
9. Digestive System:										
Stomatitis	..	..	..	..	1	..	1	..	..	..
Thrush	1	..	..	..	..	..	..	..	..	..
Caries of Teeth	..	..	1	..	..	..	..	..	..	..
Ulceration of Gums	..	..	3	..	..	..	..	..	..	..
Gum Boil	..	..	..	..	1	..	..	..	2	..
Tonsillitis	147	..	11	..	7	..	1	..	10	..
Gastritis	3	..	1	..	..	..	..	..	..	..
Dyspepsia	183	..	23	..	26	..	4	..	46	..
Enteritis	..	..	..	..	1	..	..	..	2	..
Dysentery	13	1	39	..	70	2	21	..	9	1
Diarrhœa	86	1	22	..	145	..	5	..	31	..
Hernia	4	..	..	..	1	..	..	..	5	..
Colic	13	..	6	..	9	..	6	..	1	..
Tænia Solium	8	..	1	..	..	..	..	..	1	..
Ascaris Lumbricoides	1	..	..	..	1	..	..	..	..	..
Constipation	3	..	1	..	2	..	..	..	1	..
Fistula in Ano	5	..	..	..	1	..	..	..	..	..
Hæmorrhoids	43	..	4	..	12	..	1	..	..	..
Hepatitis	122	9	38	1	59	5	..	..	10	..
Congestion of Liver	1	..	..	..	..	..	..	..	7	..
Jaundice	14	..	..	..	8	..	1	..	2	..
Splenitis	4	..	10	..	..	..	..	..	..	..
Peritonitis	2	1	..	..	..	..	..	..	..	..
Ascites	2	..	..	..	..	..	..	..	..	..
Thread Worm	..	..	1	..	..	..	..	..	..	..
Mediastinal Tumour	..	..	..	..	..	..	1	..	..	..
Ulcerated Throat	..	..	..	..	..	..	1	..	..	..
Inflammation of Gums	3	..	..	..	..	..	..	..	..	..
Quinsy	7	..	..	..	..	..	..	..	..	..
Hæmatemesis	1	..	..	..	..	..	..	..	..	..
Condyloma Ani	5	..	..	..	..	..	..	..	1	..
Pharyngitis	1	..	..	..	..	..	..	..	..	..
Tænia	1	..	..	..	..	..	..	..	..	..
10. Urinary System:										
Nephritis	5	..	..	..	1	..	..	..	..	..
Gonorrhœa	823	..	35	..	60	..	21	..	46	..
Phimosis, &c.	5	..	..	..	1	..	1	..	..	..
Bubo	69	..	10	..	..	..	7	..	16	..
Epididymitis (Gon.)	35	..	..	..	3	..	..	..	2	..
Stricture of Urethra	17	..	3	..	5	1	..	..	4	..
Urinary Fistula	..	..	..	..	1	..	..	..	..	..
Cystitis	1	..	1	..	1	..	..	..	..	..
Inflamm: of Prostrate Glands	3	..	..	..	..	..	..	..	..	..
Retention of Urine	..	1	..	..	..	..	..	..	..	..

Abstract No. 18—*continued.*

Stations	Cape and St. Helena.		Mauritius.		Ceylon. White.		Ceylon. Black.		Straits Settlements.	
Strength	4,447		589		906		943		541	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
11. Generative System:										
Varicocele	..	..	..	..	1	..	..	..	1	..
Hydrocele	3	..	..	..	..	..	1	..	1	..
Orchitis	69	..	5	..	31	..	10	..	12	..
Protrusion of Tubuli	1	..	..	..	..	..	..	..	..	..
12. Organs of Locomotion:										
Ostitis	1	..	2	..	4	..	1	..	..	..
Caries	2	..	..	..	..	..	..	..	..	..
Necrosis	..	..	..	..	1	..	..	..	..	..
Synovitis	14	..	..	..	2	..	..	..	1	..
Dropsy of Joint	..	..	..	..	..	..	..	..	1	..
Osseous Tumour	..	..	1	..	..	..	..	..	..	..
Enlarged Bursa Petellæ	2	..	..	..	..	..	..	..	..	..
Tumour of Leg	..	..	1	..	..	..	..	..	..	..
Bursal Abscess	..	..	..	..	..	..	1	..	..	..
Bursal Tumour	1	..	..	..	1	..	..	..	..	..
Contraction	2	..	..	..	..	..	..	..	..	..
13. Diseases of Cellular Tissue:										
Inflammation of Cellular Tissue	11	..	1	..	3	..	1	..	5	..
Abscess „ „	117	..	11	..	22	..	17	..	18	..
14. Cutaneous System:										
Urticaria	2	..	..	..	1	..	..	..	..	..
Psoriasis	3	..	..	..	1	..	..	..	2	..
Herpes	7	..	1	..	8	..	..	..	1	..
Eczema	20	..	4	..	15	..	2	..	5	..
Impetigo	7	..	..	..	..	..	..	..	..	..
Rupia	..	..	2	..	..	..	..	..	..	..
Ecthyma	..	..	..	..	1	..	..	..	..	..
Ingrown Nail	9	..	..	..	1	..	..	..	..	..
Roseola	..	..	..	..	1	..	..	..	..	..
Prurigo	..	..	..	..	1	..	..	..	..	..
Miliaria	..	..	..	..	1	..	..	..	..	..
Acne	1	..	..	..	..	..	..	..	..	..
Tumour	1	..	..	..	..	..	..	..	..	..
Tinea	6	..	..	..	..	..	..	..	..	..
Vermes	1	..	..	..	..	..	..	..	..	..
Erythema	..	..	..	..	..	..	..	..	3	..
Pemphigus	..	..	..	..	..	..	..	..	1	..
Ringworm	..	..	..	..	..	..	..	..	1	..
Ulcer	266	..	8	..	97	..	53	1	34	..
Boil	67	..	19	..	16	..	8	..	5	..
Carbuncle	..	..	1	..	1	..	..	..	..	..
Whitlow	18	..	2	..	5	..	..	..	6	..
Itch	26	..	1	..	5	..	19	..	..	..
Warts	4	..	..	..	2	..	2	..	2	..
III. *Conditions, &c.*:										
General Debility	38	..	1	..	3	..	..	..	..	..

Abstract No. 18—*continued.*

Stations	Cape and St. Helena.		Mauritius.		Ceylon. White.		Ceylon. Black.		Straits Settlements.	
Strength	4,447		589		906		943		541	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
IV. *Poisons.*										
Delirium Tremens	59	..	8	1	32	..	..	..	2	1
Alcohol	1	1	6	..	14	1	..	..	7	..
Morphia	1	..	..	..	..	..	..	..	..	..
Ricinus Communis	1	..	..	..	..	..	..	..	..	..
V. *Injuries.*										
2. Accidental:										
Burns and Scalds	14	..	1	..	2	..	..	..	..	..
Lightning Stroke	5	1	..	..	..	..	..	..	..	..
Multiple Injury	..	1	..	..	..	..	..	..	..	..
Asphyxia by Drowning	..	3	..	..	..	1	..	..	..	..
Contusion	315	..	21	..	42	1	7	..	33	..
Concussion of the Brain	1	..	..	..	..	..	..	..	..	..
Fracture	28	..	1	..	2	..	..	..	..	..
Wounds	141	..	9	..	37	..	17	..	10	..
Sprain	124	..	10	..	28	..	4	..	19	..
Dislocation	5	..	1	..	1	..	..	..	2	..
Blisters of the Feet	37	..	..	..	12	..	..	..	2	..
3. Homicidal:										
Bayonet Wound	..	1	..	..	..	..	..	..	..	..
4. Self-inflicted:										
Drowning	..	..	..	..	..	1	..	..	..	..
Gunshot	2	1	..	..	..	..	..	..	..	..
Cut Throat	1	..	..	..	..	..	..	..	..	..
VI. *Surgical Operations.*										
Amputation of Finger	2	..	..	..	..	..	..	..	..	..
„ Toe	1	..	..	..	..	..	..	..	..	..
No appreciable Disease	3	..	..	..	6	..	..	..	..	..
Totals	5,103	46	1,211	7	1353	22	477	10	612	3

CAUSES of the Deaths of the Invalids.

	Cape and St. Helena.	Mauritius.	Ceylon. White.
Phthisis Pulmonalis	4	1	3
Morbus Valv: Cordis	1	..	..
Bronchitis	..	..	1
Ascites	1	..	..
Psoriasis	..	..	1
Total	6	1	5

APPENDIX No. XXX—*continued.*

ABSTRACT No. 19, showing the Number of Men sent home from the Cape of Good Hope and St. Helena, Mauritius, Ceylon and the Straits Settlements in 1869, as Invalids, and of Invalids finally discharged the Service in these Colonies and in England.

Diseases.	Invalids.									
	Sent Home from				Discharged at Cape.	Discharged at Ceylon. Black Troops.	Discharged at Netley from			
	Cape and St. Helena.	Mauritius.	Ceylon. White.	Straits Settlements.			Cape and St. Helena.	Mauritius.	Ceylon.	Straits Settlements.
I. *General Diseases.*										
Ague	..	..	1	..	..	1	4	..	..	..
Chronic Rheumatism	1	..	..	..	..	..	6	..	..	..
Muscular „	..	..	..	..	1	..	..	..	..	..
Secondary Syphilis	7	1	2	..	..	..	13	..	2	..
Scrofula	..	..	..	..	..	..	1	..	..	..
Phthisis Pulmonalis	11	..	12	1	..	..	17	..	3	..
Hæmoptysis (Tub.)	..	..	..	..	..	..	1	..	..	..
Anæmia	..	..	..	..	..	..	1	..	2	..
Lupus	..	..	1	..	..	..	..	..	..	..
Chronic Osteo-Arthritis	..	..	..	..	..	..	1	..	..	..
II. *Local Diseases.*										
1. Diseases of the Nervous System:										
Encephalitis	2	..	..	..	..	..	..	..	..	..
Paralysis	4	..	..	..	..	..	8	..	1	..
Epilepsy	3	..	..	..	1	..	1	..	2	..
Dementia	3	..	..	..	..	..	..	..	..	..
2. Diseases of the Eye:										
Conjunctivitis	3	..	1	..	..	..	2	..	..	..
Tarsal Opthalmia	2	..	..	..	..	1	2	..	..	..
Keratitis	2	..	..	..	1	..	..	..	..	..
Entropium	1	..	..	..	..	..	1	..	..	..
Ulcer of Cornea	..	..	..	..	..	..	1	..	..	..
Opacity „	..	..	..	..	..	3	1	..	..	..
Shortsight	..	..	..	..	..	..	1	..	..	..
3. Diseases of the Ear:										
Deafness	1	..	..	..	1	..	..	..	..	..
Perforation of Membr: Tympani	..	..	..	..	..	..	1	..	..	..
5. Circulatory System:										
Valve Disease of Heart	4	..	2	..	..	1	18	..	1	5
Hypertrophy „	1	..	2	..	..	..	..	..	..	..
Palpitation „	..	..	..	3	..	..	3	..	..	..
Aneurism of Aorta	1	..	..	..	..	..	..	..	..	..
Varicose Veins	..	..	..	..	..	..	1	..	..	..
8. Respiratory System:										
Aphonia	..	..	..	..	..	..	1	..	..	..
Laryngitis	..	..	..	..	..	..	1	..	..	1
Bronchitis	2	..	..	..	..	..	..	..	..	..
Pleurisy	..	..	..	..	..	..	2	..	..	..

Abstract No. 19—*continued.*

Diseases.	Invalids.									
	Sent Home from				Discharged at Cape.	Discharged at Ceylon. Black Troops.	Discharged at Netley from			
	Cape and St. Helena.	Mauritius.	Ceylon. White.	Straits Settlements.			Cape and St. Helena.	Mauritius.	Ceylon.	Straits Settlements.
9. Digestive System:										
Dyspepsia	..	..	..	..	..	..	1	..	..	..
Dysentery	..	1	4	1	..	..	1	..	1	..
Diarrhœa	..	..	2	..	..	..	1	1	..	..
Hernia	..	..	..	..	1	..	..	..	..	..
Hepatitis	3	..	9	1	..	..	4	..	..	1
Splenitis	..	..	..	..	..	..	1	..	..	..
Congestion of Liver	2	..	..	..	..	..	..	..	..	..
Hypertrophy of Spleen	..	..	..	..	..	..	2	..	..	..
10. Urinary System:										
Epididymitis (Gon:)	1	..	..	..	1	..	..	..	..	..
Stricture of Urethra	..	..	1	..	..	..	..	..	..	..
11. Generative System:										
Orchitis	1	..	..	..	..	..	2	..	..	..
12. Organs of Locomotion:										
Caries	..	..	..	..	..	..	1	..	..	..
Synovitis	1	..	..	..	..	..	..	1	..	..
Knock-knee	1	..	..	..	..	..	..	..	..	..
14. Cutaneous System:										
Psoriasis	..	..	..	..	1	..	..	..	..	..
Eczema	..	..	..	1	..	..	..	..	1	..
Ulcer	3	..	..	..	..	..	6	..	..	..
Ichthyosis	..	..	..	1	..	..	..	..	..	..
III. *Conditions, &c.*										
General Debility	1	2	..	1	..	18	8	..	..	1
IV. *Poisons.*										
Delirium Tremens	..	..	..	..	1	..	..	..	..	..
V. *Injuries.*										
2. Accidental:										
Multiple Injury	..	..	..	..	..	..	1	..	..	..
Fracture	..	..	1	..	..	..	2	..	..	..
Wounds	..	..	..	1	..	..	..	..	..	..
Dislocation	..	..	1	..	..	..	..	..	..	..
4. Self-inflicted:										
Cut Throat	..	..	..	..	..	..	1	..	..	..
VI. *Surgical Operations.*										
Amputation of Fingers	..	..	..	..	..	..	1	..	..	..
„ „ Thigh	..	..	..	..	..	..	1	..	1	..
Total	61	4	39	10	8	24	121	2	14	8

APPENDIX No. XXX—*continued.*

ABSTRACT No. 20, showing the Ages of the Troops serving at the Cape of Good Hope and St. Helena, and the Deaths at each Age, during the Year 1869.

Age	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength.	Died.	Strength.	Died.	Strength.	Died.	Strength.	Died.	Strength.	Died.	Strength.	Died.	Strength.	Died.
Royal Artillery ..	17	1	79	1	58	..	42	..	12	..	1	..	209	2
„ Engineers ..	..	..	9	..	11	1	19	1	11	..	3	..	53	2
1st Bn. 9th Foot ..	24	..	176	2	213	2	182	4	76	1	12	..	683	9
2nd „ 11th „ ..	29	..	180	2	295	2	181	1	57	2	8	..	700	7
32nd Foot	12	..	151	2	234	1	74	..	47	..	..	..	518	3
Cape Mounted Rifles	181	..	171	..	63	1	44	..	15	1	3	2	477	4
Total	263	1	766	7	874	7	492	6	218	4	27	2	2,640	7

APPENDIX No. XXX—*continued.*

ABSTRACT No. 21, showing the Admissions into Hospital and Deaths among the Troops serving in Australia, New Zealand, China, and Japan, during the year 1869.

Stations	Australia.		New Zealand.		China. White.		China. Black.		Japan.	
Strength	1,072		701		577		895		672	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
I. *General Diseases.*										
1. Febrile:										
Small Pox	..	..	..	..	..	..	1	..	1	..
Scarlet Fever	..	..	1	..	..	..	..	..	..	..
Typhus „	..	..	..	..	..	..	..	..	1	..
Enteric „	3	..	..	..	..	..	..	..	1	..
Simple cont: Fever	13	1	4	..	..	..	..	..	31	..
Febricula	7	..	6	..	3	..	..	..	42	..
Ague	1	..	..	..	29	..	148	..	2	..
Remittent Fever	2	..	..	..	115	..	1	..	..	..
Influenza	..	..	23	..	1	..	..	..	4	..
Erysipelas	..	..	1	..	1	..	..	..	1	..
Mumps	..	..	..	..	..	..	..	..	3	..
2. Constitutional:										
Acute Rheumatism	20	..	22	..	6	..	39	1	11	..
Chronic „	3	..	3	..	5	..	..	..	1	..
Muscular „	1	..	14	..	7	..	7	..	3	..
Primary Syphilis	92	..	11	..	19	..	2	..	108	..
Secondary „	44	..	6	..	22	..	1	..	67	..
Scrofula	..	..	..	..	..	..	..	..	1	..
Phthisis Pulmonalis	8	3	10	1	8	..	1	..	7	1
Hæmoptysis (Tub.)	3	..	1	..	1	..	1	..	..	..
Purpura	1	..	..	..	..	..	..	..	..	..
Anæmia	..	..	1	..	..	..	..	..	4	..
General Dropsy	..	..	..	..	..	..	2	..	..	..
Beri-Beri	..	..	..	..	..	..	8	1	..	..
II. *Local Diseases.*										
1. Diseases of the Nervous System:										
Apoplexy	..	..	..	..	..	1	1	1	..	..
Paralysis	3	..	4	1	..	..	4	1	1	..
Epilepsy	4	..	..	..	4	..	1	..	..	..
Hysteria	..	..	..	..	..	..	1	..	..	..
Neuralgia	1	..	27	..	5	..	..	..	1	..
Headache	1	..	..	..	..	..	..	..	..	..
Mania	1	..	2	..	1	..	..	..	1	..
Dementia	3	..	1	..	..	..	3	..	10	..
Hypochondriasis	..	..	1	..	..	..	..	..	..	..
2. Diseases of the Eye:										
Conjunctivitis	24	..	31	..	7	..	5	..	117	..
Sclerotitis	..	..	..	..	..	..	..	..	1	..
Iritis	1	..	1	..	..	..	..	..	2	..
Retinitis	..	..	1	..	..	..	..	..	..	..
Amaurosis	..	..	..	..	1	..	..	..	2	..

Abstract No. 21—*continued.*

Stations	Australia.		New Zealand.		China.				Japan.	
					White.		Black.			
Strength	1,072		701		577		895		672	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Short-sight	..	..	1	..	..	..	..	..	..	..
Hordeolum	..	..	..	..	..	..	..	..	1	..
Tarsal Ophthalmia ..	7	..	5	..	..	..	..	..	1	..
3. Diseases of the Ear:										
Inflam: Membr: Tymp:	1	..	4	..	2	..	..	..	5	..
Deafness	..	..	2	..	..	..	..	..	..	..
Inflam: ext: Meatus	..	..	1	..	1	..	..	..	..	..
4. Diseases of the Nose:										
Polypus Nasi ..	..	..	..	..	1	..	1	..	..	..
5. Circulatory Syst.										
Valve Dis: of Heart	1	..	1	..	4	1	..	..	7	1
Hypertrophy „ ..	..	..	2	1	..	..	..	..	..	..
Atrophy of Heart ..	..	..	..	..	..	..	1	1	..	..
Syncope	..	..	..	..	..	..	1	1	..	..
Fatty Degn: of Heart	..	..	..	..	..	..	..	1	..	..
Palpitation „ ..	1	..	2	..	1	..	..	..	1	..
Aneurism of Aorta	1	1	1	..	2	1	..	..	..	..
Aneurism	1	..	..	..	..	..	..	..	..	..
Varicose Veins ..	2	..	8	..	1	..	..	..	1	..
6. Absorbent Syst.:										
Inflam. of Glands ..	11	..	..	..	3	..	..	..	..	..
8. Respiratory Syst.:										
Laryngitis	..	..	..	..	1	..	..	..	..	..
Bronchitis ..	30	..	59	..	27	..	28	..	23	..
Asthma	1	..	..	..	..	..	1	..	..	..
Pneumonia	..	..	5	..	1	..	7	1	2	..
Pleurisy	3	..	3	..	6	..	1	..	5	..
Pass: Conges: of Lung	..	..	..	..	1	..	..	..	..	..
9. Digestive Syst.:										
Sore Throat ..	3	..	..	..	..	..	..	..	..	..
Relaxed Throat ..	..	..	..	..	1	..	..	..	..	..
Tonsillitis	10	..	16	..	4	..	1	..	12	..
Gastritis	1	..	..	..	3	..	..	..	..	..
Ulcer of Stomach ..	..	..	..	..	1	..	..	..	..	..
Hæmatemesis ..	..	..	..	..	..	..	1	..	..	..
Dyspepsia	23	..	56	..	74	..	8	..	17	..
Dysentery	3	..	..	..	4	..	47	2	..	..
Diarrhœa	8	..	10	..	47	..	83	9	14	..
Hernia	2	..	1	..	1	..	2	..	..	..
Colic	3	..	12	..	2	..	..	..	..	..
Tænia Solium ..	1	..	..	..	..	..	..	..	3	..
Constipation ..	..	..	2	..	1	..	..	..	2	..
Fistula in Ano ..	..	..	..	..	3	..	1	..	..	..
Prolapsus of Anus ..	..	..	..	..	1	..	..	..	..	..

Abstract No. 21—*continued.*

Stations	Australia.		New Zealand.		China. White.		China. Black.		Japan.	
Strength	1,072		701		577		895		672	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Fissure of Anus	1	..	..	..	..	..	..	..	..	..
Hæmorrhoids	8	..	5	..	4	..	3	..	2	..
Hepatitis	..	..	11	..	13	1	..	..	8	..
Enlargement of Liver	..	..	..	..	1	..	..	..	..	..
Congestion „	..	..	..	..	1	..	..	..	..	..
Jaundice	2	..	2	..	2	..	3	1	..	..
Splenitis	..	..	1	..	..	..	..	..	..	..
Peritonitis	..	..	..	..	1	..	..	..	..	..
10. Urinary Syst.:										
Bright's Disease	3	1	..	..	..	..	..	..	..	..
Nephritis	1	..	..	..	..	..	..	..	..	..
Abscess of Kidney	..	..	1	..	..	..	..	..	..	..
Retention of Urine	..	..	..	..	1	..	..	..	..	..
Incontinence of Urine	1	..	1	..	..	..	..	..	..	..
Hæmaturia	3	..	..	..	..	..	2	..	..	..
Diuresis	..	..	2	..	..	..	..	..	..	..
Gonorrhœa	125	..	14	..	54	..	8	..	199	..
Phimosis, &c.	4	..	..	..	..	..	1	..	..	..
Bubo	15	..	..	..	2	..	2	..	12	..
Epididymitis Gon.	2	..	..	..	..	..	..	..	..	..
Stricture of Urethra	5	..	2	..	5	..	1	..	1	..
Urinary Fistula	2	..	..	..	2	..	..	..	1	..
Inflam of Prost Gland	1	..	..	..	..	..	..	..	..	..
Irritability of Bladder	1	..	..	..	..	..	..	..	..	..
Cystitis	1	..	1	..	..	..	..	..	..	..
11. Generative Syst.										
Hydrocele	2	..	..	..	1	..	..	..	2	..
Orchitis	11	..	4	..	16	..	1	..	14	..
Elephantiasis of Scrotum	..	..	..	..	..	..	1	..	..	..
12. Organs of Loco.										
Synovitis	..	..	2	..	..	..	..	..	..	..
Bunion	..	..	..	..	..	..	..	..	1	..
13. Diseases of Cellular Tissue:										
Inflam: of Cel: Tissue	1	..	..	..	3	..	3	..	7	..
Abscess „ „	6	..	6	..	3	..	17	..	11	..
14. Cutaneous Syst.										
Urticaria	..	..	1	..	..	..	..	..	..	..
Lichen	..	..	..	..	..	..	..	..	1	..
Psoriasis	1	..	5	..	..	..	9	..	1	..
Eczema	1	..	3	..	3	..	1	..	..	..
Impetigo	..	..	1	..	..	..	..	..	..	..
Erythema	..	..	..	..	1	..	..	..	..	..
Porrigo	1	..	..	..	..	..	..	..	..	..
Prurigo	..	..	1	..	..	..	..	..	..	..
Acne	..	..	2	..	..	..	..	..	..	..
Tinea	..	..	..	..	..	..	..	..	..	..
Ulcer	18	..	12	..	19	..	8	..	2	..
Boil	26	..	25	..	11	..	..	..	31	..
									6	..

Abstract No. 21—*continued.*

Stations	Australia.		New Zealand.		China. White.		China. Black.		Japan.	
Strength	1,072		701		577		895		672	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Carbuncle	..	..	..	..	..	..	1	..	1	..
Whitlow	5	..	8	..	2	..	..	..	..	..
Itch	..	..	2	..	..	..	21	..	15	..
Warts	2	..	..	..	1	..	..	..	3	..
Stings of Bees	..	..	..	..	..	..	1	..	..	..
III. *Conditions, &c.*										
General Debility	..	..	..	..	2	..	16	..	..	..
IV. *Poisons.*										
Delirium Tremens	7	..	12	..	16	1	..	..	16	..
Alcohol	..	1	..	..	..	..	..	..	..	1
V. *Injuries.*										
2. Accidental:										
Burns and Scalds	3	..	2	..	1	..	1	..	2	..
Asphyxia by Drown:	..	..	..	1	..	..	..	..	..	1
Contusion	58	..	52	..	33	..	8	..	36	..
Rupt: of Globe of Eye	..	..	..	..	1	..	..	..	..	..
Fracture	13	..	2	..	5	..	1	..	1	..
Wounds	29	..	21	..	12	..	3	..	16	..
,, from Gunshot	..	..	..	..	..	..	..	..	1	..
Sprain	35	..	13	..	13	..	7	..	33	..
Dislocation	2	..	1	..	..	..	..	..	..	..
Blisters of the Feet	3	..	2	..	..	..	..	..	..	..
3. Homicidal:										
Wounds	2	..	..	..	..	..	..	..	..	..
4. Self-inflicted:										
Gunshot	..	..	..	..	..	..	..	..	..	1
VI. *Surgical Operations:*										
For Phimosis	..	..	..	..	2	..	..	..	..	..
Exci: Met: Phal. Joint	..	..	..	..	1	..	..	..	..	..
No appreciable disease	3	..	1	..	2	..	..	..	..	..
Total	753	7	580	4	662	5	538	20	940	5

CAUSES of the Deaths of the Invalids.

	Australia.	New Zealand.	China.	Japan.
Phthisis Pulmonalis	..	..	3	1
Valve Disease of Heart	..	..	1	..
Aneurism of Aorta	..	..	1	..
Laryngitis	..	..	1	..
Total	..	..	6	1

APPENDIX No. XXX—*continued.*

ABSTRACT No. 22, showing the Number of Men sent home from Australasia and China and Japan, in 1869, as Invalids, and the Number discharged the Service as Invalids in Australasia and in England.

Diseases.	Australasia.			China and Japan.		
	Sent Home as Invalids.	Discharged the Service.		White.		Asiatic
		In Colony.	In England.	Sent Home as Invalids.	Discharged at Netley.	Sent to India.
I. *General Diseases.*						
Ague	..	..	1	..	..	..
Remittent Fever	..	..	..	3	..	..
Acute Rheumatism	..	..	..	1	..	2
Chronic „	..	..	1	4	1	..
Secondary Syphilis	..	..	..	5	1	..
Scrofula	..	..	1	1	1	..
Phthisis Pulmonalis	7	..	..	9	4	..
Hæmoptysis	..	..	..	..	1	..
Beri Beri	..	..	..	..	..	3
II. *Local Diseases.*						
1. Diseases of the Nervous System:						
Paralysis	1	..	4	..	..	1
Epilepsy	1	..	..	..	..	..
Neuralgia	1	..	..	..	..	..
Mania	..	..	..	2	..	..
Dementia	2	..	..	..	..	2
2. Diseases of the Eye:						
Conjunctivitis	4	..	3	29	11	..
Opacity of Cornea	..	..	..	..	3	..
Short Sight	1	..	1	..	..	..
Cataract	..	..	1	..	..	..
Tarsal Ophthalmia	1	..	..	..	..	..
3. Diseases of the Ear:						
Deafness	1	..	..	..	..	..
5. Circulatory System:						
[illegible]arditis	..	..	..	1	..	..
Peri[illegible] Disease of Heart	3	..	4	1	1	..
Valve [illegible]ohy „	1	..	..	..	..	..
Hypertro[illegible] „	..	..	1	..	..	..
Palpitation [illegible]orta	..	1	..	1	..	..
Aneurism of [illegible]	4	..	..	..	..	..
Varicose Veins						
8. Respiratory Sys[illegible]tem:						
Laryngitis	..	..	..	1	..	..
Bronchitis	..	..	..	..	..	2
Pneumonia	..	..	..	..	1	..

Abstract No. 22—*continued.*

Diseases.	Australasia.			China and Japan.		
	Sent Home as Invalids.	Discharged the Service.		White.		Asiatic.
		In Colony.	In England.	Sent Home as Invalids.	Discharged at Netley.	Sent to India.
9. Digestive System:						
Dysentery	..	..	..	..	..	3
Diarrhœa..	..	..	..	..	..	2
Fistula in Ano	..	..	..	1	..	..
Hepatitis	..	..	..	1	2	..
Jaundice..	..	..	..	..	..	1
10. Urinary System:						
Hæmaturia	..	..	..	..	..	2
Stricture of Urethra	..	..	..	1	1	..
11. Generative System:						
Orchitis	..	..	..	1	..	..
Elephantiasis of Scrotum	..	..	..	..	..	1
12. Organs of Locomotion:						
Necrosis	..	..	1	..	1	..
13. Diseases of Cellular Tissue:						
Abscess of Cellular Tissue	..	..	..	1	..	..
III. *Conditions, &c.*						
General Debility	..	..	3	..	..	7
V. *Injuries.*						
2. Accidental:						
Burns and Scalds	1	..	..	..	..	..
Fracture	2	..	..	..	1	1
Sprain	3	..	..	..	..	..
Total	33	1	21	63	29	27

APPENDIX No. XXX—*continued.*

ABSTRACT No. 23, showing the Admissions into Hospital and Deaths among Her Majesty's European Troops serving in Madras and Bombay, during the Year 1869, and the disabilities of the Invalids sent to England from India and of those discharged at Netley.

Diseases.	Madras.		Bombay.		Invalids sent Home from			India.
Average Strength	10,277		10,538					55,988
	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
I. *General Diseases.*								
Sub-division A:								
Small Pox	10	3	16	1	..	..	..	..
Chicken Pox	1	..	2	..	..	..	..	..
Measles	1	..	3	..	..	..	..	..
Typhus Fever	..	1	1	..	..	..	..	..
Enteric „	40	11	7	6	..	..	..	..
Simple continued Fever	578	3	1,148	8	20	1	1	..
Febricula	274	..	272	..	1	..	..	..
Ague	1,065	..	5,440	1	102	10	4	12
Remittent Fever	225	10	249	15	30	..	1	..
Simple Cholera	3	1	..	..	..	..	..	..
Malignant Cholera	39	23	81	55	1	..	..	..
Choleraic Diarrhœa	18	3	10	1	..	..	..	..
Influenza	27	..	18	..	..	..	..	..
Erysipelas	15	..	6	..	..	..	..	..
Pyæmia	..	..	1	1	..	..	..	..
Mumps	2	..	2	..	..	..	..	..
Sub-division B:								
Acute Rheumatism	160	..	179	..	8	..	..	..
Chronic „	265	..	181	2	109	24	12	24
Muscular „	94	..	86	..	1	1	2	2
Gonorrhœal „	11	..	1	..	..	..	..	..
Gout	..	..	3	..	..	..	..	..
Primary Syphilis	787	..	754	1	..	..	..	..
Secondary „	387	3	299	2	87	54	20	59
Cancer	1	1	..	..	2	..	..	2
Scrofula	28	..	16	..	16	7	2	6
Phthisis Pulmonalis	119	11	109	14	157	42	32	150
Hæmoptysis (Tub.)	4	..	5	..	1	1	2	1
Purpura	1	..	1	..	..	..	..	..
Scurvy	7	1	14	..	1	..	..	..
Anæmia	74	..	129	..	128	9	14	27
General Dropsy	8	..	4	..	3	..	1	1
Chronic Osteo-Arthritis	..	..	..	..	..	1	..	2
Lupus	4	..	..	..	..	1	..	..
Diabetes	2	..	..	..	..	..	..	2
Fibrous Tumour	..	..	..	..	2	..	..	..
II. *Local Diseases.*								
1. Nervous System:								
Encephalitis	2	..	12	..	6	1	3	..
Meningitis	3	1	5	1	1	1	..	3
Abscess of Brain	1	1	1	1	..	..	..	..
Apoplexy	14	15	8	10	..	..	..	..
Sunstroke	32	15	61	17	13	1	2	1
Inflam: of Cord	..	..	1	1	4	..	..	..

Abstract No. 23—*continued.*

Diseases.	Madras.		Bombay.		Invalids sent Home from			India.
Average Strength	10,277		10,538					55,988
	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
Paralysis	24	3	16	1	24	4	6	28
Epilepsy	28	1	37	..	26	9	8	13
Chorea	..	..	..	..	1	..	..	..
Hysteria	1	..	2	..	..	..	..	..
Neuralgia	134	..	47	..	10	9	2	4
Anæsthesia	..	..	2	..	..	..	..	..
Hypochondriasis	4	..	2	..	..	..	1	..
Mania	7	1	11	..	8	7	5	..
Dementia	10	..	28	..	24	2	5	..
Spasms	4	..	..	..	..	..	..	..
Spasm of Muscle	..	..	..	..	..	1	..	..
Headache	..	..	..	..	..	5	..	5
Catalepsy	..	..	..	..	1	..	..	..
2. Diseases of the Eye:								
Conjunctivitis	222	..	349	..	3	..	7	18
Tarsal Ophthalmia	14	..	23	..	3	1	..	1
Ulcer of Cornea	3	..	2	..	..	..	1	..
Opacity of Cornea	3	..	3	..	..	2	..	4
Keratitis	..	..	..	..	1	..	..	..
Sclerotitis	1	..	..	..	..	..	..	..
Iritis	8	..	2	..	1	..	..	4
Retinitis	..	..	1	..	..	..	..	..
Amaurosis	3	..	3	..	2	2	1	..
Lachrymal Abscess	1	..	1	..	..	..	..	..
Impaired Vision	1	..	3	..	..	..	..	12
Short Sight	2	..	1	..	5	..	1	8
Hemeralopia	..	..	2	..	..	..	..	1
Nyctalopia	..	..	7	..	..	..	1	..
Hordeolum	1	..	..	..	..	..	..	..
Entropium	1	..	..	..	..	..	..	..
Cataract	..	..	..	..	..	1	..	3
Loss of Eye	..	..	..	..	..	..	..	1
3. Diseases of the Ear:								
Inflam: external Meatus	22	..	5	..	..	..	..	..
Abscess „ „	4	..	..	..	1	..	..	..
Inflam: Membr: Tympani	14	..	39	..	..	..	1	1
Deafness	23	..	19	..	7	3	1	17
4. Diseases of the Nose:								
Epistaxis	..	..	4	..	1	..	..	..
Warts	..	..	2	..	..	..	..	..
Ozœna	1	..	1	..	2	..	..	..
Hypertrophy	..	..	1	..	..	..	..	..
Polypus Nasi	1	..	..	..	..	..	..	..
5. Circulatory System:								
Pericarditis	2	1	3	..	3	..	1	..
Endocarditis	..	..	3	..	..	..	1	..
Valve Disease of Heart	46	4	21	3	55	17	6	194
Hypertrophy „	18	1	19	..	59	7	10	5
Dilatation „	..	..	..	..	2	..	..	..
Atrophy „	..	1	..	..	2	1	..	..
Fatty Degeneration	..	..	2	2	1	..	..	2
Rupture „	..	..	1	1	..	..	..	..

Abstract No. 23—*continued.*

Average Strength	Madras. 10,277		Bombay. 10,538		Invalids sent Home from			India. 55,988
Diseases.	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
Angina Pectoris	..	..	1	..	1	..	1	..
Syncope	..	..	1	..	..	..	..	..
Palpitation	34	..	86	..	25	5	5	18
Aneurism of Aorta	13	7	10	4	2	4	1	6
Aneurism	5	1	3	1	7	..	..	2
Phlebitis	2	..	..	..	..	..	..	..
Varicose Veins	4	..	10	..	10	1	2	25
6. Absorbent System:								
Inflammation of Glands	149	..	214	..	2	..	..	..
Suppuration „	28	..	26	..	..	..	..	..
8. Respiratory System:								
Coryza	5	..	4	..	..	..	..	..
Laryngitis	2	..	4	..	..	..	..	..
Bronchitis	381	1	427	2	52	10	6	7
Asthma	12	..	7	..	4	2	1	3
Pneumonia	18	1	40	6	4	2	1	1
Pulmonary extravasation	2	2	1	1	..	..	..	..
Emphysema	2	..	..	..	5	..	..	3
Pleurisy	23	..	20	..	8	..	1	5
Empyema	..	1	..	..	..	..	..	..
9. Digestive System:								
Stomatitis	1	..	4	..	..	..	..	..
Gum Boil	12	..	14	..	..	..	..	..
Necrosis Alveoli	3	..	1	..	..	1	..	..
Loss of Teeth	..	..	..	..	..	1	..	..
Tonsillitis	157	..	204	..	1	1	..	..
Gastritis	2	..	2	..	1	1	..	..
Hæmatemesis	2	..	3	..	..	..	..	..
Dyspepsia	757	..	363	..	20	10	..	6
Enteritis	5	..	1	1	..	..	..	..
Dysentery	674	18	316	12	33	66	9	20
Diarrhœa	933	8	705	3	30	12	..	10
Hæmorrhage (Intestinal)	..	..	2	..	..	..	..	..
Melæna	..	..	2	..	..	..	..	..
Obstruction of Bowels	..	..	1	..	..	..	..	..
Tympanitis	..	..	1	..	..	..	..	..
Hernia	8	..	7	..	17	1	1	24
Colic	69	..	78	..	..	..	..	..
Tænia Solium	38	..	33	..	1	..	..	..
Ascaris Lumbricoides	1	..	1	..	..	..	..	..
Constipation	36	..	17	..	..	1	..	..
Fistula in Ano	13	..	15	..	3	..	..	1
Abscess of Anus	1	..	1	..	..	..	..	..
Prolapsus Ani	..	..	1	..	..	..	..	..
Hæmorrhoids	105	..	80	..	2	4	..	2
Hepatitis	769	58	463	17	231	97	37	40
Cirrhosis	..	..	2	..	1	..	..	..
Jaundice	35	1	51	..	..	..	..	1
Splenitis	70	..	44	..	10	7	1	2
Hypertrophy of Spleen	..	..	2	..	..	..	1	5
Peritonitis	1	..	2	2	..	..	..	..
Ascites	1	..	3	3	..	..	..	1
Enlargement of Mesenteric Glands	..	..	1	..	..	..	1	..

Abstract No. 23—*continued.*

Diseases.	Madras. Admitted.	Madras. Died.	Bombay. Admitted.	Bombay. Died.	Invalids sent Home from: Bengal.	Madras.	Bombay.	India. Discharged at Netley.
Average Strength	10,277		10,538					55,988
Typhlitis	2	..	..	..	..	..	..	..
Condyloma Ani	7	..	..	..	..	..	..	..
Salivary Fistula	2	..	..	..	..	..	..	..
Inflam: of Salivary Glands	1	..	..	..	..	..	..	..
Abdominal Tumour	..	..	..	..	1	..	..	..
Stricture of Rectum	..	..	..	..	..	..	..	1
Prolapsus „ „	..	..	..	..	1	..	..	..
10. Urinary System:								
Bright's Disease	9	1	5	2	9	3	2	9
Nephritis	4	..	4	1	2	1	..	..
Gonorrhœa	798	..	626	..	..	1	..	..
Phimosis, &c.	5	..	3	..	..	..	..	..
Bubo	195	..	24	..	..	1	..	..
Epididymitis (Gon:)	18	..	40	..	..	..	..	..
Stricture of Urethra	33	..	29	..	14	2	..	3
Urinary Fistula	2	..	..	..	..	..	..	1
Calculus	3	..	1	..	..	..	..	..
Hæmaturia	..	..	1	..	..	..	..	..
Cystitis	3	..	1	..	1	..	1	..
Retention of Urine	1	..	1	..	..	..	..	..
Incontinence of Urine	4	..	1	..	1	..	..	2
Diuresis	..	..	..	..	1	..	..	..
Urinary Abscess	..	..	1	1	..	..	..	..
„ Fistula	..	..	1	..	2	..	1	..
Extravasation of Urine	..	..	1	..	..	..	..	..
11. Generative System:								
Varicocele	4	..	5	..	3	..	..	1
Hydrocele	12	..	5	..	..	..	..	..
Orchitis	167	..	114	..	5	2	..	3
Neuralgia Testis	1	..	..	..	..	..	..	..
Spermatorrhœa	1	..	..	..	..	..	..	..
Malformed Testicle	..	..	..	..	1	..	..	..
12. Organs of Locomotion:								
Ostitis	18	..	10	..	3	..	1	2
Caries	1	..	..	..	..	..	..	2
Necrosis	1	..	1	..	1	..	..	2
Synovitis	28	..	18	..	6	1	3	6
Dropsy of Joint	2	..	..	..	..	..	..	..
Psoas Abscess	..	..	1	..	1	..	1	1
Ganglion	..	..	1	..	..	..	..	..
Deformity of Spine	3	..	1	..	..	..	2	2
Tumour of Muscle	..	..	2	..	..	..	..	1
Contracted Palmar Fascia	..	..	1	..	..	..	..	..
Bursal Abscess of Patella	..	..	1	..	..	..	..	..
Bunion	..	..	1	..	..	..	..	1
Contraction	4	..	..	..	6	3	..	24
Enlargement of Bursa of Hand	..	..	..	..	..	..	1	..
Bony Tumour	..	..	..	..	1	..	..	..
Knock Knee	..	..	..	..	1	..	..	..
Lameness	..	..	..	..	1	..	..	..
Atrophy of Muscles	..	..	..	..	..	..	..	3
13. Diseases of Cellular Tissue:								
Inflam: of Cellular Tissue	38	..	46	..	..	..	..	..
Abscess „ „	123	..	150	..	..	2	1	1
Obesity	..	..	..	..	1	..	..	1

Abstract No. 23—*continued.*

Diseases.	Madras. Admitted.	Madras. Died.	Bombay. Admitted.	Bombay. Died.	Invalids sent Home from Bengal.	Invalids sent Home from Madras.	Invalids sent Home from Bombay.	India. Discharged at Netley.
Average Strength	10,277		10,538					55,988
14. Cutaneous System:								
Urticaria	6	..	6	..	..	..	..	..
Lichen	5	..	11	..	..	..	..	..
Psoriasis	7	..	5	..	..	..	..	1
Herpes	43	..	18	..	..	..	..	..
Eczema	37	..	62	..	..	..	1	1
Impetigo	5	..	2	..	..	..	..	..
Ulcer	403	..	299	..	21	14	3	12
Boil	311	..	291	..	..	..	..	..
Carbuncle	8	..	6	1	..	..	..	..
Whitlow	49	..	18	..	..	..	..	..
Itch	17	..	9	..	..	..	..	..
Warts	26	..	10	..	..	..	..	..
Erythema	1	..	10	..	..	..	..	..
Roseola	2	..	1	..	..	..	..	..
Prurigo	..	..	2	..	..	..	..	..
Pityriasis	..	..	9	..	..	..	..	..
Pemphigus	8	..	4	..	..	..	..	..
Ephelis	..	..	1	..	..	..	..	..
Ingrown Nail	10	..	4	..	..	..	..	..
Guinea Worm	39	..	8	..	..	..	..	..
Tinea	17	..	4	..	..	..	..	..
Tumour (not specified)	10	..	..	..	..	..	..	1
Stings	2	..	..	..	..	..	..	..
Ecthyma	9	..	..	..	..	..	..	..
Corns	6	..	..	..	..	..	..	..
Acne	7	..	..	..	..	..	..	..
Pediculi	1	..	..	..	..	..	..	..
Cheloid	..	..	..	..	1	..	..	..
III. *Conditions, &c.*								
General Debility	329	1	100	..	232	84	18	141
Old age	..	..	..	..	1	..	..	..
Loss of Teeth	..	..	..	..	1	..	..	..
IV. *Poisons.*								
Delirium Tremens	117	10	71	5	..	..	..	..
Alcohol	159	2	61	..	1	..	..	..
Insect Sting	..	..	1	..	..	..	..	..
V. *Injuries.*								
2. Accidental:								
Burns and Scalds	15	..	14	..	..	..	..	..
Multiple Injury	..	1	..	1	..	..	..	..
Asphyxia by Drowning	1	4	..	2	..	..	..	..
Contusion	623	..	532	..	..	..	1	3
Rupture of Stomach	1	1	..	..	..	..	..	..
Concussion of the Brain	4	..	4	2	4	1	..	1
Laceration of Brain	..	..	..	1	..	..	..	..
Fracture	70	4	46	1	18	4	2	16
Wounds	234	..	120	..	4	3	3	1
„ from Gunshot	2	..	..	..	3	..	..	3
Sprain	241	..	181	..	..	1	..	1

Abstract No. 23—*continued.*

Average Strength	Madras. 10,277		Bombay. 10,538		Invalids sent Home from			India. 55,988
Diseases.	Admitted.	Died.	Admitted.	Died.	Bengal.	Madras.	Bombay.	Discharged at Netley.
Dislocation	13	..	6	..	1	..	..	3
Blisters of the Feet	22	..	15	..	..	..	..	..
Dog-bite	10	..	..	..	..	..	..	..
Fish-bite	1	..	..	..	..	..	..	..
3. Homicidal:								
Concussion of Brain	..	1	..	..	..	..	..	..
Scalp Wound	..	..	2	..	..	..	..	..
Gun Shot	..	..	1	1	..	..	..	..
Bayonet	..	..	1	..	..	..	..	..
Stabbed	..	1	..	..	..	..	..	..
Cut Throat	..	..	..	..	1	..	..	..
4. Self-inflicted:								
Poison	..	1	..	..	..	..	..	..
Gun Shot	..	8	1	7	..	..	..	..
Hanging	..	..	..	1	..	..	..	..
Cut Throat	1	1	..	1	..	..	..	..
Drowning	..	1	..	2	..	..	..	..
Wound	1	..	..	..	..	..	..	1
5. Judicial:								
Hanging	..	..	..	1	..	..	..	..
VI. *Surgical Operations.*								
Amputation of Arm	..	..	2	..	..	..	..	..
„ of Fingers ..	..	..	..	..	2	..	..	..
Various	..	..	..	..	..	..	..	7
No appreciable Disease	13	..	1	..	..	..	..	..
Total	13,654	246	16,096	226	1,798	573	263	1,052

Causes of the Deaths of the Invalids.

	Madras.	Bombay.
I.—2. Phthisis	7	3
II.—1. Paralysis	..	1
5. Valve Disease of Heart	1	..
Atrophy of Heart	..	1
Aneurism „	..	..
8. Pneumonia	..	2
Bronchitis	1	1
9. Dysentery	5	1
Hepatitis	4	..
10. Bright's Disease	..	1
III. Debility	3	..
Total	25	10

APPENDIX No. XXX—*continued.*

ABSTRACT No. 24, showing the Ages of the Troops serving in the Madras Command, and the Deaths at each Age, during the Year 1869.

	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.
16th Lancers	16	..	96	3	160	2	141	5	20	..	9	1	442	11
18th Hussars	14	..	57	..	167	5	175	8	23	1	5	..	441	14
D Brigade Royal Horse Artillery..	23	..	128	2	176	9	127	4	103	3	12	..	569	18
5th „ Royal Artillery ..	17	..	160	3	144	5	106	5	52	3	13	..	492	16
20th „ „	9	..	110	1	230	9	203	5	93	5	26	1	671	21
23rd „ „	16	..	158	4	193	5	253	5	54	3	23	..	697	17
1st Battalion 1st Foot	19	..	167	1	192	5	334	8	103	7	17	..	832	21
2nd „ 10th „	10	..	82	3	372	8	206	3	45	3	4	2	719	19
2nd „ 21th „	5	1	105	1	597	4	135	9	28	4	1	1	871	20
2nd „ 24th „	187	..	292	11	139	11	45	8	22	3	..	..	685	33
45th Foot	320	..	300	4	143	8	50	3	8	1	..	..	821	16
3rd Battalion 60th Foot	25	2	155	3	183	3	318	6	73	..	2	..	756	14
76th Foot	30	1	150	1	275	6	185	5	53	2	6	..	699	15
Total ..	691	4	1,960	37	2,971	80	2,278	74	677	35	118	5	8,695	235

APPENDIX No. XXX—*continued.*

Abstract No. 24—*cont.*

ABSTRACT showing the Ages of the Troops serving in the Bombay Command, and the Deaths at each Age, during the Year 1869.

	Under 20 Years.		20 and under 25.		25 and under 30.		30 and under 35.		35 and under 40.		40 and upwards.		Total.	
	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.	Strength, 1st Jan.	Died.
2nd Dragoon Guards	6	..	153	1	161	1	39	4	11	2	2	..	372	8
3rd Hussars..	30	..	161	..	110	2	74	3	37	1	7	..	419	6
E Brigade Royal Horse Artillery.	2	..	139	2	177	2	156	6	39	1	12	2	525	13
6th „ Royal Artillery ..	59	2	129	2	149	5	99	4	31	3	..	..	467	16
18th „ „	30	..	183	4	344	3	188	7	62	2	18	..	825	16
2nd Battalion 1st Foot	57	4	212	21	283	10	154	11	40	5	3	..	749	51
1st „ 2nd „	21	..	342	2	221	3	157	1	64	2	10	1	815	9
1st „ 8th „	79	1	283	5	237	3	82	2	48	..	2	..	731	11
49th Foot	71	..	303	4	226	8	123	9	57	..	6	1	786	22
82nd „	10	..	52	2	171	..	237	3	191	7	10	3	671	15
95th „	55	..	135	6	237	2	235	3	76	4	12	1	750	16
108th „	153	..	309	5	179	6	120	4	44	1	4	..	809	16
Total	573	7	2,401	54	2,495	45	1,664	57	700	28	86	8	7,919	199

APPENDIX No. XXX—*continued.*

ABSTRACT No. 25, showing the Cases of Sickness, and Deaths, among Troops on board Ship, proceeding on Foreign Service.

Stations	To India, overland.		To India, viâ the Cape.		To various Stations.	
Number of Men embarked	7,481		570		1,897	
Average Annual Strength	718		176		475	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
I. *General Diseases.*						
Sub-division A:						
Measles	6	..	..	..	..	..
Typhus Fever	1	1	..	..	..	..
Simple continued Fever	18	..	..	..	3	..
Febricula	2	..	..	..	3	..
Ague	5	..	3	..	4	..
Remittent Fever	1	..	..	..	1	..
Influenza	3	..	..	..	..	..
Erysipelas	3	..	..	..	..	..
Sub-division B:						
Acute Rheumatism	16	..	..	..	1	..
Chronic „	..	..	..	..	1	..
Muscular „	1	..	..	..	..	..
Primary Syphilis	85	..	9	..	12	..
Secondary „	14	..	2	..	5	..
Scrofula	1	..	..	..	1	..
Phthisis Pulmonalis	..	..	2	..	1	..
Scurvy	..	..	5	..	3	..
Anæmia	7	..	2	..	..	..
General Dropsy	1	..	..	..	..	..
II. *Local Diseases.*						
1. Diseases of the Nervous Syst:						
Apoplexy	..	..	..	..	1	1
Paralysis	2	..	..	..	..	..
Sunstroke	3	1	..	..	1	..
Epilepsy	2	..	..	..	1	..
Neuralgia	1	..	..	..	1	..
Mania	..	..	..	..	1	..
Dementia	..	..	..	..	1	..
2. Diseases of the Eye:						
Conjunctivitis	6	..	1	..	3	..
Tarsal Ophthalmia	3	..	..	..	..	..
Nyctalopia	..	..	..	..	1	..
Hœmeralopia	..	..	..	..	3	..
5. Circulatory System:						
Valve Disease of Heart	..	..	..	..	1	..
6. Absorbent System:						
Inflammation of Glands	2	..	..	..	..	..

Abstract No. 25—*continued.*

Stations	To India, overland.		To India, viâ the Cape.		To various Stations.	
Number of Men embarked	7,481		570		1,897	
Average Annual Strength	718		176		475	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
8. Respiratory System:						
Bronchitis	16	..	2	..	10	..
Pneumonia	5	1	2	..	3	2
Pulmonary Extravasation	..	..	..	..	2	..
Pleurisy	1	..	..	..	2	..
9. Digestive System:						
Tonsillitis	11	..	2	..	10	..
Dyspepsia	3	..	1	..	3	..
Hæmatemesis	1	..	..	..	..	..
Enteritis	1	1	..	..	..	..
Dysentery	1	..	..	..	..	..
Diarrhœa	13	..	2	..	21	..
Colic	2	..	..	..	..	..
Constipation	..	..	..	..	4	..
Hæmorrhoids	1	..	..	..	..	..
Condyloma Ani	..	..	..	..	3	..
Hepatitis	3	..	1	..	1	..
Jaundice	3	..	1	..	2	..
Sea Sickness	..	..	..	..	1	..
10. Urinary System:						
Gonorrhœa	54	..	8	..	14	..
Epididymitis	2	..	..	..	..	..
Bubo	13	..	..	..	6	..
Stricture of Urethra	..	..	1	..	..	..
11. Generative System:						
Hydrocele	1	..	..	..	..	..
Orchitis	10	..	1	..	3	..
12. Organs of Locomotion:						
Ostitis	2	..	..	..	..	..
Acute Synovitis	2	..	1	..		..
13. Diseases of Cellular Tissue:						
Abscess of Cellular Tissue	13	..	10	..	4	..
14. Cutaneous System:						
Herpes	..	..	1	..	..	..
Eczema	1	..	..	..	1	..
Impetigo	1	..	..	..	..	..
Erythema	1	..	..	..	..	..
Intertrigo	..	..	1	..	..	..
Ulcer	28	..	7	..	8	..
Boil	10	..	..	..	6	..
Whitlow	5	..	..	..	1	..
Itch	12	..	2	..	13	..

Abstract No. 25—*continued.*

Stations	To India, overland.		To India, viâ the Cape.		To various Stations.	
Number of Men embarked	7,481		570		1,897	
Average Annual Strength	718		176		475	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
III. *Conditions, &c.*						
General Debility	3	..	..	..	3	..
IV. Poisons.						
Delirium Tremens	1	..	..	..	..	..
V. Injuries.						
2. Accidental:						
Burns and Scalds	2	..	5	..	2	..
Asphyxia by Drowning	..	..	..	..	1	1
Contusion	12	..	2	..	11	..
Concussion of the Brain	1	1	..	..	..	..
Fracture	..	..	2	..	1	..
Wounds	4	..	1	..	10	..
Sprain	2	..	2	..	2	..
4. Self-inflicted:						
Multiple Injury	..	1	..	..	..	..
5. Judicial:						
Corporal Punishment	..	..	..	..	1	..
Total	424	6	79	..	200	4

APPENDIX No. XXX—*continued.*

ABSTRACT No. 26, showing the Cases of Sickness, and Deaths, among Troops on Board Ship, proceeding on Passage Home.

Stations	From Canada.		From West Indies, Australia, and Cape.		From India.	
Number of Men embarked	1,545		2,296		1,858	
Average Annual Strength	62		289		158	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
I. *General Diseases.*						
Sub-division A:						
Simple continued Fever	..	..	10	..	3	..
Ague	..	..	1	..	21	..
Remittent Fever	..	..	..	..	2	..
Erysipelas	1	..	..	..	..	..
Sub-division B:						
Acute Rheumatism	..	..	7	..	..	..
Chronic „	..	..	1	..	..	..
Gonorrhœal „	..	..	..	..	1	..
Primary Syphilis	3	..	21	..	6	..
Secondary „	..	..	5	..	1	..
Scrofula	..	..	1	..	..	..
Phthisis Pulmonalis	..	..	4	..	4	..
II. *Local Diseases.*						
1. Diseases of the Nervous Syst:						
Paralysis	..	..	..	..	1	..
2. Diseases of the Eye:						
Conjunctivitis	..	..	6	..	4	..
5. Circulatory System:						
Valve Disease of Heart	..	..	1	1	..	..
Aneurism of Aorta	..	..	..	..	1	..
6. Absorbent System:						
Inflammation of Glands	1	..	3	..	7	..
Suppuration „	..	..	2	..	..	..
8. Respiratory System:						
Bronchitis	1	..	5	..	3	..
Pneumonia	..	..	..	..	1	..
Pulmonary Extravasation	..	..	1	..	..	..
9. Digestive System:						
Tonsillitis	1	..	3	..	1	..
Gastritis	..	..	1	..	..	..
Dyspepsia	1	..	2	..	..	..
Dysentery	..	..	..	..	3	1
Diarrhœa	..	..	3	..	6	..
Colic	..	..	..	..	1	..
Hæmorrhoids	..	..	1	..	..	..

Abstract No. 26—*continued.*

Stations	From Canada.		From West Indies, Australia, and Cape.		From India.	
Number of Men embarked	1,545		2,296		858	
Average Annual Strength	62		289		158	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
Hepatitis	1	..	2	..	7	..
Jaundice	..	..	1	..	..	..
Splenitis	..	..	..	..	1	..
10. Urinary System:						
Gonorrhœa	8	..	12	..	2	..
Epididymitis	..	..	1	..	..	..
Bubo	..	..	..	..	1	..
11. Generative System:						
Orchitis	2	..	4	..	..	..
12. Organs of Locomotion:						
Necrosis	..	..	1	..	1	..
13. Diseases of Cellular Tissue:						
Inflammation of Cellular Tissue ..	1	..	1	..	3	..
Abscess „ ..	..	..	2	..	..	..
14. Cutaneous System:						
Herpes	..	..	1	..	..	..
Eczema	1	..	1	..	1	..
Ulcer	2	..	9	..	11	..
Boil	..	..	15	..	..	..
Carbuncle	..	..	1	..	..	..
Warts	..	..	4	..	..	..
Gangrene	..	..	1	..	..	..
Tumour	..	..	..	..	1	..
IV. *Poisons.*						
Delirium Tremens	..	..	..	..	..	1
V. *Injuries.*						
2. Accidental:						
Burns and Scalds	..	..	2	..	..	..
Contusion	..	..	12	..	3	..
Fracture	..	..	1	..	..	..
Wounds	..	..	6	..	..	..
Sprain	..	..	7	..	..	..
Total	28	..	162	1	97	2

APPENDIX No. XXX—*continued.*

ABSTRACT No. 27, showing the Cases of Sickness and Deaths among Troops on Board Ship proceeding from one Colony or Station to another.

Stations	Between Canada, Bermuda, and the West Indies.		Between India and Ceylon.		Between Australia, China Singapore, and Ceylon.	
Number of Men Embarked ..	2,826		1,712		1,218	
Average Annual Strength ..	102		118		44	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
I. *General Diseases.*						
Sub-division A:						
Small Pox	..	..	1	..	..	..
Simple continued Fever ..	1	..	..	..	..	..
Febricula	..	..	..	..	1	..
Ague	..	..	3	..	4	..
Remittent Fever	2	..	..	..	..	..
Influenza	1	..	..	..	..	..
Sub-division B:						
Acute Rheumatism	2	..	..	..	1	..
Primary Syphilis	1	..	6	..	2	..
Secondary „	3	..	2	..	1	..
Phthisis Pulmonalis	..	..	1	..	..	..
II. *Local Diseases.*						
1. Diseases of the Nervous Syst:						
Sunstroke	..	..	3	3	..	..
Epilepsy	1	..	..	..	..	..
Neuralgia	1	..	..	..	1	..
2. Diseases of the Eye:						
Conjunctivitis	3	..	..	..	..	..
3. Diseases of the Ear:						
Inflammation Membr: Tympani	1	..	..	..	..	..
8. Respiratory System:						
Bronchitis	2	..	3	..	1	..
Pneumonia	2	..	..	..	..	..
9. Digestive System:						
Tonsillitis	1	..	..	..	1	..
Dyspepsia	1	..	..	..	..	..
Dysentery	..	..	3	1	..	..
Diarrhœa	..	..	2	..	5	..
Colic	1	..	..	..	1	..
Hæmorrhoids	1	..	..	..	1	..
Prolapsus of Anus	..	..	1	..	..	..
Hepatitis	..	..	2	..	..	..

Abstract No. 27—*continued.*

Stations	Between Canada, Bermuda, and the West Indies.		Between India and Ceylon.		Between Australia, China, Singapore, and Ceylon.	
Number of Men Embarked ..	2,826		1,712		1,218	
Average Annual Strength ..	102		118		44	
Diseases.	Admitted.	Died.	Admitted.	Died.	Admitted.	Died.
10. Urinary System:						
Gonorrhœa	..	..	8	..	6	..
Bubo	1	..	..	..	..	..
11. Generative System:						
Orchitis	..	..	1	..	..	..
13. Diseases of Cellular Tissue:						
Abscess of Cellular Tissue ..	6	..	..	..	..	..
14. Cutaneous System:						
Psoriasis	1	..	..	..	..	..
Ulcer	4	..	5	..	1	..
Boil	..	..	2	..	..	..
Corn	..	..	1	..	..	..
III. *Conditions, &c.*						
General Debility	..	..	2	..	..	..
IV. *Poisons.*						
Delirium Tremens	1	1	..	..	..	..
V. *Injuries.*						
2. Accidental:						
Burns and Scalds	1	..	..	..	1	..
Contusion	..	..	2	..	1	..
Wounds	3	..	..	..	..	..
Blisters of the Feet	..	..	..	..	1	..
4. Self-inflicted:						
Drowning	..	1	..	..	..	..
Total	41	2	48	4	29	..

APPENDIX No. XXXI.

ABSTRACT of Results of Meteorological Observations taken at Home Stations in the Year 1869.

APPENDIX

ABSTRACT of Results of Meteorological Observations

ALDERSHOT CAMP. Lat. 51° 15′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	29·619	30·137	28·674	54·4	25·2	29·2	46·7	34·9	11·8	40·8	59·9	32·1	41·8	40·2
February	29·499	29·924	28·583	58·0	30·4	27·6	51·4	39·4	12·0	45·4	75·4	36·9	46·7	44·4
March	29·344	29·786	28·768	55·4	25·0	30·4	45·6	32·2	13·4	38·9	74·7	31·1	39·5	37·5
April	29·520	29·821	28·719	76·6	29·8	46·8	61·5	41·9	19·6	51·7	101·3	39·1	54·7	49·2
May	29·341	29·709	28·736	67·4	33·2	34·2	60·5	44·1	16·4	52·3	100·2	41·7	53·5	49·6
June	29·612	29·807	29·007	85·0	38·0	47·0	67·6	46·2	21·4	56·9	117·0	43·2	60·7	54·2
July	29·609	29·911	29·337	90·2	45·4	44·8	78·2	53·8	24·4	66·0	122·6	51·1	70·3	62·7
August	29·664	29·889	29·297	89·2	37·0	52·2	74·0	50·1	23·9	62·0	113·8	47·6	66·0	59·4
September	29·353	29·899	28·767	78·8	37·8	41·0	68·9	50·9	18·0	59·9	108·2	47·5	61·8	57·8
October...	29·580	30·007	28·914	75·4	29·6	45·8	59·2	43·0	16·2	51·1	88·0	40·7	51·9	48·7
November	29·475	29·999	28·795	58·4	27·2	31·2	51·2	36·9	14·3	44·1	71·3	35·0	44·4	42·4
December	29·321	30·030	28·805	54·2	18·8	35·4	42·3	32·3	10·0	37·3	56·1	30·7	37·9	36·6
Yearly Sums, Means, and Totals ...	29·495	29·910	28·867	70·2	31·4	38·8	58·9	42·1	16·8	50·5	90·7	39·7	52·4	48·5

CANTERBURY. Lat. 51° 17′ N.

January	...	...	...	56·5	19·5	37·0	47·9	32·1	15·8	40·0	...	...	42·5	41·5
February	...	...	...	58·5	24·5	34·0	52·4	35·6	16·8	44·0	...	...	47·2	45·7
March	...	...	...	52·0	20·0	32·0	46·0	29·5	16·5	37·7	...	...	40·6	38·6
April	...	...	...	78·5	29·0	49·5	62·0	38·2	23·8	50·1	...	...	55·3	52·4
May	...	...	...	69·6	27·5	42·1	62·6	40·4	22·2	51·5	...	...	56·0	53·2
June	...	...	...	84·5	33·5	51·0	67·5	42·9	24·6	55·2	...	...	60·8	57·6
July	...	...	...	88·5	40·0	48·5	77·0	48·8	28·2	62·9	...	...	69·9†	66·4†
August	...	...	...	87·0	38·0	49·0	72·9	47·3	25·6	60·1	...	...	66·4‡	62·2‡
September	...	...	...	*	36·5	...	...	47·9	...	...	...	...	65·7	62·7
October	...	...	...	...	26·0	...	...	38·6	...	...	...	...	55·0	51·5
November	...	...	...	...	23·5	...	...	34·9	...	...	...	...	48·2	46·7
December	...	...	...	...	22·0	...	...	31·7	...	...	...	...	40·0	39·1
Yearly Sums, Means, and Totals ...	...	...	...	...	28·3	...	...	38·9	...	...	...	...	54·0	51·5

CHATHAM. Lat. 51° 23′ N.

January	29·895	30·407	28·975	55·1	22·5	32·6	46·3	32·5	13·8	39·4	58·3	28·5	41·5	39·9
February	29·818	30·264	28·898	58·8	27·2	31·6	50·5	37·3	13·2	43·9	68·6	36·1	45·9	44·0
March	29·650	30·111	28·976	49·8	22·6	27·2	42·1	29·9	12·2	36·0	59·4	26·3	38·5	36·5
April	29·847	30·174	29·022	77·6	27·6	50·0	59·0	39·6	19·4	49·3	93·4	35·6	54·2	48·4
May	29·674	30·100	29·047	71·3	30·0	41·3	60·1	41·9	18·2	51·0	100·5	38·1	54 5	51·3
June	29·930	30·167	28·820	86·0	33·4	52·6	65·7	43·9	21·8	54·8	103·0	40·0	59·9	54·9
July	29·946	30·270	29·696	88·6	42·1	46·5	75·7	51·3	24·4	63·5	114·1	47·5	69·3	62·6
August	29·997	30·228	29·186	83·2	41·0	42·2	70·5	49·9	20·6	60·2	106·1	46·1	65·0	59·3
September	29·667	30·261	29·956	77·6	40·8	36·8	67·2	49·7	17·5	58·5	100·7	42·6	62·7	57·9
October...	29·885	30·338	29·255	75·4	25·0	50·4	57·6	40·4	17·2	49·0	85·0	37·6	52·2	48·8
November	29·785	30·307	29·084	58·0	25·2	32·8	49·5	35·1	14·4	42·3	66·3	32·7	45·6	43·0
December	29·657	30·435	29·158	54·0	15·4	38·6	41·8	30·0	11·8	35·9	54·4	28·0	38·0	36 3
Yearly Sums, Means, and Totals ...	29·813	30·258	29·114	69·6	29·4	40·2	57·1	40·1	17·0	48·6	84·1	36·6	52·3	48·6

* Instrument broken. † For 25 days only, the wet bulb having been broken. ‡ For 26 days only.

No. XXXI

taken at Home Stations in the Year 1869.

Long. 0° 45′ W. Height above Sea 325 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind,	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	Feet above the Ground.
											lbs. per sq. foot.	Miles				Inches	Inches
38·2	·231	2·7	0·4	88·0	546·9	1·00	6·50	17·00	6·50	0·00	...	263·0	8·1	1·8	16	3·46	1·93
41·8	·265	3·0	0·6	83·9	539·2	3·00	1·50	11·00	12·50	0·00	...	408·7	8·2	2·5	18	3·23	2·19
34·9	·203	2·3	0·5	84·0	544·6	12·50	9·50	3·00	6·00	0·00	...	331·3	5·4	3·0	18	1·22	0·65
43·9	·287	3·3	1·6	66·5	531·3	5·50	7·00	8·50	9·00	0·00	...	258·0	7·4	2·6	11	1·36	0·92
45·7	·307	3·5	1·1	75·1	529·1	7·50	9·00	7·50	7·00	0·00	...	247·7	8·2	3·0	18	4·57	3·50
48·5	·342	3·8	2·1	64·2	526·4	10·50	5·00	5·00	9·50	0·00	...	213·9	7·4	2·5	9	1·38	1·07
56·8	·464	5·1	3·0	62·6	516·1	6·00	5·50	9·00	10·50	0·00	...	214·7	6·6	2·1	4	1·06	0·98
54·0	·417	4·6	2·4	65·6	521·5	9·00	6·50	4·00	11·50	0·00	...	213·2	6·5	2·1	6	1·20	0·92
54·4	·424	4·7	1·5	77·0	520·7	2·00	3·50	12·50	12·00	0·00	...	342·4	6·8	2·6	14	3·65	2·53
45·5	·306	3·4	0·9	78·8	535·2	7·00	3·50	7·50	13·00	0·00	...	241·8	8·9	2·8	16	2·36	1·89
40·0	·248	2·8	0·5	84·8	541·5	8·00	0·00	6·00	16·00	0·00	...	292·6	7·5	2·3	14	2·19	1·54
34·9	·203	2·4	0·3	89·2	545·9	10·00	5·00	7·00	9·00	0·00	...	337·0	8·1	2·7	20	3·47	2·25
44·9	·308	3·4	1·2	76·6	533·2	82·00	62·50	98·00	122·50	0·00	...	289·3	7·5	2·5	164	29·17	20·37

Long. 1° 5′ E. Height above Sea 80 feet.

40·3	·250	2·9	0·2	92·0	...	2·00	0·50	10·50	15·00	3·00	...	...	4·4	3·0	13	2·05	...
44·0	·289	3·3	0·4	89·7	...	7·00	1·00	3·50	15·50	1·00	...	...	5·1	3·4	13	3·64	...
36·1	·212	2·5	0·5	84·6	...	12·50	9·50	2·00	7·00	0·00	...	...	3·2	2·9	6	1·64	...
49·6	·357	4·0	0·9	81·9	...	7·50	9·00	4·00	9·50	0·00	...	...	2·8	3·1	7	1·64	...
50·6	·370	4·2	0·8	82·2	...	4·00	12·50	5·50	8·00	1·00	...	...	4·2	4·0	17	4·78	...
54·8	·431	4·9	1·1	81·6	...	7·00	8·00	2·50	9·50	3·00	...	...	3·3	3·9	8	1·05	...
63·7†	·589†	6·5‡	1·5†	80·5†	...	1·50	2·50	3·50	19·50	4·00	...	...	2·1	3·2	3	0·29	...
58·8‡	·497‡	5·5‡	1·6‡	77·0‡	...	4·50	5·00	3·00	12·50	6·00	...	...	3·0	3·6	9	1·39	...
60·3	·524	5·7	1·2	83·0	...	2·50	3·00	11·00	13·50	0·00	...	...	3·5	3·6	12	3·21	...
48·1	·337	3·8	1·1	78·0	...	9·50	2·00	5·50	12·00	2·00	...	...	3·0	3·3	8	2·01	...
45·1	·300	3·4	0·4	89·5	...	7·50	1·00	3·50	18·00	0·00	...	...	3·6	3·4	9	1·86	...
37·9	·228	2·6	0·3	92·8	...	8·00	4·50	9·00	7·50	2·00	...	...	3·2	3·2	14	2·25	...
49·1	·365	4·1	0·8	92·7	...	73·50	58·50	63·50	147·50	22·00	...	...	3·4	3·4	119	25·81	...

Long. 0° 32′ E. Height above Sea 160 feet.

																	*
37·9	·229	2·6	0·4	88·2	552·5	0·00	2·25	17·25	9·50	2·00	...	200·0	8·3	1·4	15	2·26	2·19
41·8	·265	3·0	0·6	85·7	546·0	3·50	0·00	6·50	17·00	1·00	...	309·5	8·6	2·3	22	3·26	3·12
33·8	·194	2·2	0·5	84·0	551·6	11·75	10·25	3·25	5·75	0·00	...	318·9	8·6	0·4	23	2·32	2·19
44·7	·295	3·4	1·4	70·0	537·5	3·25	10·50	7·50	7·75	1·00	...	226·4	6·0	2·3	10	1·34	1·29
48·2	·336	3·8	0·9	78·8	533·8	4·75	13·75	6·00	6·00	0·50	...	250·7	8·3	2·4	21	4·72	4·65
50·5	·368	4·1	1·7	71·0	532·6	4·25	6·25	4·50	14·50	0·50	...	177·9	6·3	1·8	13	1·73	1·71
57·4	·471	5·1	2·7	65·2	522·8	2·75	6·75	6·25	15·25	0·00	...	176·5	4·8	2·4	4	0·24	0·23
54·6	·427	4·7	2·1	69·5	528·1	4·00	9·25	3·50	12·25	2·00	...	192·5	5·8	2·0	13	2·35	2·24
53·8	·416	4·6	1·7	73·0	524·7	2·00	3·00	12·25	12·75	0·00	...	‖	6·5	4·3	15	3·53	3·28
45·3	·303	3·4	1·0	77·8	540·4	6·00	4·25	7·25	12·00	1·50	...	296·1	6·3	1·2	14	3·65	3·32
40·0	·248	2·8	0·7	81·4	545·9	9·75	0·50	8·50	19·75	0·50	...	256·4	7·2	2·1	17	2·20	2·10
34·0	·195	2·3	0·4	85·4	552·2	9·00	6·00	11·50	4·00	0·50	...	314·9	8·9	1·6	20	3·88	3·75
45·1	·312	3·5	1·2	77·5	539·0	52·00	72·75	94·25	136·50	9·50	...	235·9	7·1	2·0	187	31·48	30·07

* 3 feet above the ground.
‡ For 25 days only.
† For 25 days only, the wet bulb having been broken.
‖ Anemometer out of order.

Appendix

COLCHESTER. Lat. 50° 53′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	29·842	30·345	28·907	57·0	21·4	35·6	48·2	32·4	15·8	40·3	61·0	28·9	42·7	40·7
February ...	29·760	30·196	28·796	59·0	24·6	34·4	51·4	35·6	15·8	43·5	69·2	33·0	47·0	44·7
March	29·623	30·115	28·888	53·8	20·0	33·8	45·1	29·3	15·8	37·2	72·8	25·5	40·4	38·1
April	29·797	30·150	28·957	76·6	24·6	52·0	61·4	38·6	22·8	50·0	96·5	34·3	55·7	50·5
May	29·635	30·051	28·973	70·0	31·2	38·8	60·4	41·2	19·2	50·8	90·5	39·5	54·4	50·3
June	29·858	30·087	29·150	68·6	32·4	56·2	66·6	43·2	23·4	54·9	103·6	38·8	61·2	55·1
July	29·851	30·194	29·543	85·7	41·1	44·6	76·3	51·1	25·2	63·7	114·3	45·6	69·5	62·2
August	29·900	30·182	29·249	87·5	39·5	48·0	72·4	48·3	24·1	60·3	111·9	42·9	66·3	59·9
September ...	29·569	30·198	28·814	78·0	38·3	39·7	69·0	49·4	19·6	59·2	102·4	44·5	63·9	58·4
October... ...	29·868	30·361	29·166	73·6	25·4	48·2	58·1	40·0	18·1	49·1	82·6	35·0	52·1	49·3
November ...	29·780	30·400	29·130	59·9	23·5	36·4	50·6	34·3	16·3	42·4	60·3	29·7	44·7	42·8
December ...	29·656	30·479	29·196	55·5	11·5	44·0	45·0	28·9	16·1	36·9	53·7	26·3	38·5	37·6
Yearly Sums, Means, and Totals ...	29·762	30·229	29·064	70·4	27·8	42·6	58·7	39·4	19·3	49·0	84·9	35·3	53·0	49·1

DEVONPORT. Lat. 50° 17′ N.

January ...	29·761	30·343	28·777	58·2	24·6	33·6	52·0	38·2	13·8	45·1	69·4	20·9	47·6	45·6
February ...	29·796	30·277	28·674	62·2	27·8	34·4	54·3	39·3	15·0	46·8	81·4	19·1	49·4	46·9
March	29·620	30·063	29·029	59·6	23·4	35·6	51·2	32·2	19·0	41·7	98·1	28·0	44·7	41·2
April	29·769	30·076	29·089	71·2	28·0	43·2	61·1	41·5	19·6	51·3	106·9	37·6	55·5	51·2
May	29·553	30·010	28·922	68·7	31·5	37·2	62·0	41·4	20·6	51·7	105·4	37·9	56·0	52·1
June	29·687	30·109	29·353	80·7	39·0	41·7	70·1	45·1	25·0	57·6	123·9	39·6	62·7	56·7
July	29·873	30·207	29·554	89·2	40·3	48·9	76·5	49·7	26·8	63·1	132·7	45·0	69·1	62·5
August	29·933	30·175	29·543	85·8	40·1	45·7	74·9	48·3	26·6	61·6	126·8	44·6	68·3	60·6
September ...	29·600	30·185	29·067	74·5	37·2	37·3	68·0	49·2	18·8	58·6	108·9	46·0	62·3	58·4
October... ...	29·849	30·300	29·181	77·2	27·2	50·0	61·1	42·7	18·4	51·9	85·3	38·5	55·2	51·9
November ...	29·791	30·281	28·987	60·6	22·9	37·7	55·0	35·6	19·4	45·3	72·3	31·4	48·5	44·4
December ...	29·589	30·200	28·990	55·5	9·8	45·7	46·8	29·3	17·5	38·0	50·1	25·4	41·3	39·3
Yearly Sums, Means, and Totals ...	29·752	30·185	29·097	70·2	29·3	40·9	61·0	41·0	20·0	51·0	96·7	34·5	55·0	50·9

DOVER. Lat. 51° 8′ N.

January	...	...	...	53·5	20·0	33·5	45·9	33·7	12·2	39·8	...	...	42·4	39·8
February	...	...	...	54·5	28·5	26·0	49·5	37·1	12·4	43·2	...	...	46·5	43·8
March	...	...	...	53·0	25·0	28·0	43·1	29·8	13·3	36·4	...	...	39·9	36·4
April	...	...	...	71·0	30·0	41·0	55·8	39·4	16·4	47·6	...	...	51·5	47·6
May	...	...	...	67·0	34·5	32·5	57·5	41·1	16·4	49·3	...	...	53·4	49·4
June	...	...	...	76·0	39·0	37·0	62·1	43·3	18·8	52·7	...	...	57·8	54·1
July	...	...	...	83·0	45·0	38·0	70·3	50·6	19·7	60·4	...	...	65·6	60·5
August	...	...	...	82·0	42·0	40·0	68·2	49·4	18·8	58·8	...	...	63·9	59·1
September ...	...	...	...	75·0	41·0	34·0	65·8	48·6	17·2	57·2	...	...	61·5	57·4
October... ...	...	...	...	69·0	24·0	45·0	56·4	40·5	15·9	48·5	...	...	52·4	49·3
November ...	...	...	...	55·0	25·0	30·0	49·1	34·9	14·2	42·0	...	...	45·2	41·9
December ...	...	...	...	51·0	22·0	29·0	42·0	30·2	11·8	36·1	...	...	38·9	36·5
Yearly Sums, Means, and Totals ...	...	...	...	65·8	31·3	34·5	55·5	39·9	15·6	47·7	...	...	51·6	48·0

No. XXXI—*continued.*

Long. 0° 54′ E. Height above Sea 109 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud, 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	30 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
38·3	·232	2·7	0·5	85·0	550·1	0·75	4·25	15·50	10·50	0·00	...	144·2	7·3	2·4	16	2·03	1·78
42·1	·268	3·1	0·6	83·9	543·8	3·50	1·75	8·00	14·75	0·00	...	204·7	8·0	2·1	17	2·19	1·98
35·1	·205	2·4	0·6	82·0	548·0	12·25	9·00	4·00	5·75	0·00	...	209·4	8·5	3·0	13	1·50	1·31
45·6	·309	3·6	1·5	69·0	534·9	7·50	8·25	6·50	7·75	0·00	...	194·1	6·3	3·0	7	0·70	0·60
46·3	·314	3·5	1·2	73·8	533·3	7·25	10·50	6·75	6·50	0·00	...	177·2	8·3	4·1	16	2·58	2·30
49·3	·358	4·0	2·0	66·7	530·1	10·75	4·25	5·75	9·25	0·00	...	162·5	7·4	3·6	9	1·13	1·04
56·5	·458	5·0	2·9	62·8	521·1	6·75	7·50	9·75	7·00	0·00	...	159·4	6·1	4·4	3	0·30	0·28
54·7	·428	4·7	2·3	66·4	525·3	7·50	6·75	7·50	9·25	0·00	...	177·8	6·5	4·4	16	1·30	1·16
53·8	·416	4·6	1·9	70·4	521·8	2·00	3·00	10·25	14·75	0·00	...	219·5	7·3	4·5	10	3·50	3·32
46·4	·316	3·6	0·8	81·3	540·0	7·75	3·00	7·25	12·00	1·00	...	180·9	6·7	3·2	11	2·88	2·68
40·6	·253	2·9	0·5	86·2	545·8	7·00	0·75	8·00	14·25	0·00	...	201·9	7·6	2·0	12	2·30	2·10
36·4	·215	2·5	0·2	92·9	551·4	7·00	6·00	8·00	10·00	0·00	...	197·9	8·1	2·3	16	2·97	2·68
45·5	·314	3·5	1·2	76·7	537·0	80·00	65·00	97·25	121·75	1·00	...	185·8	7·4	3·2	146	23·39	21·13

Long. 4° 5′ W. Height above Sea 35 feet.

43·4	·281	3·2	0·5	86·6	543·1	1·25	10·00	12·00	7·75	0·00	...	236·9	8·5	3·8	20	5·13	4·61
44·2	·291	3·3	0·7	82·9	541·7	4·25	1·50	7·75	13·50	1·00	...	218·1	7·6	4·6	21	4·32	4·04
37·1	·221	2·6	0·8	74·2	544·1	14·00	8·25	3·00	5·75	0·00	...	378·9	6·9	4·7	14	3·29	3·05
47·1	·326	3·7	1·3	73·7	534·5	5·50	9·50	7·50	7·50	0·00	...	270·1	5·7	4·9	12	1·75	1·58
48·4	·342	3·8	1·2	75·6	530·2	3·50	11·25	10·75	5·50	0·00	...	277·0	7·4	5·2	19	5·92	5·62
51·6	·383	4·2	2·1	67·7	528·9	7·00	3·00	6·50	7·50	1·00	...	192·5	5·4	5·3	6	0·36	0·30
57·3	·470	5·1	2·7	65·6	521·7	2·75	6·50	12·75	9·00	0·00	...	216·2	5·5	5·4	7	0·81	0·74
54·6	·426	4·6	2·9	61·2	523·9	6·25	7·50	6·00	10·75	0·50	...	281·4	4·9	4·3	7	0·82	0·72
55·1	·435	4·8	1·4	77·5	523·9	0·50	5·75	10·25	13·00	0·50	...	374·9	7·3	6·2	20	5·04	4·66
48·7	·345	3·9	1·1	79·4	536·1	12·00	5·75	4·50	7·75	1·00	...	176·6	6·8	4·2	13	2·17	1·97
39·9	·247	2·8	1·1	72·4	543·9	8·50	1·50	4·75	14·25	1·00	...	221·8	7·4	3·9	15	3·08	2·89
36·8	·218	2·5	0·5	84·8	547·1	8·25	8·00	5·25	8·50	1·00	...	353·1	7·0	4·9	16	4·21	3·88
47·0	·332	3·7	1·3	75·1	535·0	73·75	83·50	91·00	110·75	6·00	...	274·7	6·7	4·8	170	36·90	34·01

Long. 1° 19′ E. Height above Sea 325 feet.

36·6	·217	2·5	0·6	80·8	...	1·50	3·75	12·25	13·50	0·60	...	...	6·7	4·3	14	1·71	...
40·7	·255	3·0	0·6	81·6	...	2·50	2·25	6·75	16·00	0·50	...	...	6·7	5·3	15	2·97	...
31·9	·180	2·1	0·8	73·5	...	12·50	12·25	1·50	4·75	0·00	...	...	7·3	5·7	13	3·34	...
43·6	·285	3·2	1·1	75·1	...	4·00	7·50	8·00	9·50	1·00	...	...	5·3	5·1	8	2·02	...
45·4	·304	3·4	1·1	74·4	...	4·25	12·50	8·25	6·00	0·00	...	...	6·5	5·2	14	4·03	...
50·8	·371	4·1	1·2	77·6	...	5·75	9·75	5·75	8·75	0·00	...	...	6·1	4·0	8	1·02	...
56·3	·455	5·0	1·9	72·5	...	2·25	13·00	7·25	8·00	0·50	...	...	4·5	4·2	4	0·39	...
55·1	·435	4·8	1·7	73·9	...	4·25	10·75	5·00	11·00	0·00	...	...	4·6	4·4	9	1·51	...
53·9	·416	4·6	1·5	76·5	...	2·50	4·25	6·00	17·25	0·00	...	...	5·5	4·1	13	2·75	...
46·2	·313	3·5	0·9	79·8	...	11·50	2·50	5·25	11·75	0·00	...	...	5·0	3·8	12	1·65	...
38·1	·230	2·7	0·8	76·4	...	10·25	1·00	5·25	13·50	0·00	...	...	7·0	3·6	17	2·18	...
33·3	·191	2·2	0·6	81·6	...	8·50	6·50	6·50	9·50	0·00	...	...	7·2	4·6	19	2·64	...
44·3	·304	3·4	1·1	77·0	...	69·75	86·00	77·75	129·50	2·00	...	...	6·0	4·5	148	26·21	...

Appendix

GUERNSEY. Lat. 49° 33′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	29·717	30·251	28·894	58·0	25·0	33·0	50·4	34·3	16·1	42·3	66·6	25·4	45·5	43·9
February	29·825	30·315	28·894	55·0	31·0	24·0	51·5	37·9	13·6	44·7	73·5	30·6	48·9	47·1
March	29·551	30·018	29·003	52·0*	29·0	23·0	47·6	32·2	15·4	39·9	71·2	29·3	43·8	41·6
April	29·746	30·108	29·107	62·0	30·0	32·0	55·9	38·9	17·0	47·4	83·2	34·0	52·0	49·3
May	29·532	29·955	28·924	68·0	32·0	36·0	58·6	38·0	20·6	48·3	89·6	33·5	53·0	50·5
June	29·812	30·067	29·283	79·0	62·0	17·0	61·7	49·4	12·3	55·5	112·6	34·6	58·8	55·2
July	29·817	30·186	28·913	83·0	34·0	49·0	78·2	45·8	32·4	62·0	128·7	36·8	65·4	61·8
August... ...	29·876	30·850	29·254	79·0	42·0	37·0	69·1	49·5	19·6	59·3	132 6	34·8	64·1	60·1
September ...	29·622	30·561	29·095	74·8	24·9	50·8	67·7	41·9	25·8	54·8	121·8	33·3	60·8	58·1
October ...	29·813	30·689	29·236	79·0	24·0	55·0	59·9	37·2	22·7	48·6	94·3	21·0	54·3	51·5
November ...	29·763	30·264	28·960	58·0	25·0	33·0	53·3	32·9	20·4	43·1	79·0	16·1	49·2	47·1
December ...	29·548	30·110	29·124	54·0	5·0	49·0	45·6	25·3	20·3	35·5	60·9	*	43·2	41·2
Yearly Sums, Means, and Totals ...	29·723	30·276	29·057	66·8	30·2	36·6	58·3	38·6	19·7	48·4	93·2	29·9	53·2	50·6

JERSEY. Lat. 49° 11′ N.

January	...	...	...	57·0	24·0	33·0	50·3	37·8	12·5	44·1	...	...	45·0	43·0
February	...	...	...	60·0	31·0	29·0	53·7	40·7	13·0	47·2	...	...	48·5	46·7
March	...	...	...	57·0	29·0	28·0	49·7	34·1	15·6	41·9	...	...	43·8	40·9
April	...	...	...	75·0	31·0	44·0	63·4	41·8	21·6	52·6	...	...	55·1	52·3
May	...	...	...	73·0	38·0	35·0	63·3	46·1	17·2	54·7	...	...	57·3	55·1
June	...	...	...	87·0	42·0	45·0	70·7	47·5	23·2	59·1	...	...	63·1	58·4
July	...	...	...	94·0	47·0	47·0	78·3	53·9	24·4	66·1	...	...	69·9	63·9
August	...	...	...	89·3	47·4	41·9	74·7	53·2	21·5	63·9	...	...	67·8	62·0
September ...	...	...	...	83·0	33·8	49·8	70·7	51·8	18·9	61·2	...	...	64·5	60·1
October†	30·024	30·416	29·454	82·0	33·7	48·3	62·1	46·1	16·0	54·1	...	...	56·4	53·0
November	29·968	30·458	29·152	60·4	31·5	28·9	54·8	41·3	13·5	48·1	...	...	50·2	47·6
December	29·758	30·332	29·253	56·0	20·6	35·4	48·3	34·8	13·5	41·5	...	...	44·3	41·6
Yearly Sums, Means, and Totals ...	29·916	30·402	29·286	72·8	34·0	38·8	61·6	44·1	17·5	52·8	...	...	55·5	52·0

NETLEY. Lat. 50° 51′ N.

January	29·966	30·472	28·994	55·0	24·2	30·8	48·9	37·4	11·5	43·1	65·3	35·1	44·0	42·4
February	29·948	30·388	28·964	59·4	27·6	31·8	52·4	39·9	12·5	46·1	77·1	37·4	47·2	44·9
March	29·763	30·212	29·202	55·6	24·4	31·2	46·6	32·5	14·1	39·5	79·0	30·4	41·8	38·5
April	29·941	30·281	29·147	76·0	25·8	50·2	60·5	40·7	19·8	50·6	97·6	38·7	54·0	49·6
May	29·741	30·165	29·114	66·0	32·0	34·0	60·4	43·6	16·8	52·0	100·2	42·3	54·6	50·5
June	30·040	30·234	29·814	79·6	37·0	42·6	67·2	45·2	22·0	56·2	109·0	‡	61·2	55·5
July	30·045	30·368	29·756	84·8	45·0	39·8	74·7	52·3	22·4	63·5	114·9	51·2	67·7	61·4
August	30·092	30·353	29·577	84·8	41·0	43·8	73·2	50·4	22·8	61·8	110·7	47·6	66·2	59·6
September ...	29·773	30·346	29·226	75·0	38·0	37·0	68·1	51·1	17·0	59·6	100·1	49·2	62·0	57·6
October... ...	30·004	30·448	29·303	76·6	31·9	45·0	59·4	42·3	17·1	50·8	86·9	39·3	53·1	49·9
November	29·928	30·492	29·170	60·0	20·0	40·0	52·1	35·7	16·4	43·9	69·7	32·5	46·4	44·5
December	29·760	30·479	29·286	55·0	17·0	38 0	43·7	31·9	11·8	37·8	54·7	28·4	39·3	38·6
Yearly Sums, Means, and Totals ...	29·917	30·353	29·596	68·9	30·2	38·7	58·9	41·9	17·0	50·4	83·0	36·0	53·1	49·4

* 25 days only. † From 7th October inclusive. ‡ Out of order.

No. XXXI—*continued.*

Long. 2° 40′ W. Height above Sea 248 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inche
42·0	·268	3·0	0·5	88·3	545·7	7·50	5·75	12·75	5·00	0·00	...	383·3	7·4	6·6	16	0·25	0·22
45·1	·302	3·3	0·5	87·4	542·8	11·00	2·50	6·75	7·75	0·00	...	367·6	7·6	5·9	17	0·25	0·22
39·0	·238	2·7	0·5	83·2	543·6	11·75	12·50	1·00	5·75	0·00	...	†	8·5	6·9	18	0·19	‡
46·5	·317	4·4	0.8	81·8	537·9	7·00	7·25	5·75	10·00	0·00	...	...	6·5	5·8	14	0·99	...
48·0	·334	3·7	0·7	83·0	532·8	5·00	9·50	7·00	9·50	0·00	...	...	6·7	6·0	16	3·74	...
51·9	·388	4·3	1·3	78·2	531·6	12·00	6·75	3·00	8·25	0·00	...	...	4·2	4·2	6	1·23	...
58·8	·498	5·5	1·3	80·0	524·0	6·50	6·00	2·25	16·25	0·00	...	...	3·2	5·2	1	0·00	...
56·8	·463	5·1	1·5	77·0	526·3	12·00*	5·00*	0·00*	13·00*	0·00*	...	...	4·4	3·9	3	1·03	...
55·7	·445	5·0	1·0	83·8	528·8	0·25	2·50	8·25	19·00	0·00	...	...	5·8	4·7	19	3·16	...
48·8	·344	3·9	0·8	81·2	536·6	12·75	5·50	4·50	8·25	0·00	...	...	6·1	3·7	17	2·04	...
44·8	·298	3·4	0·6	85·5	541·3	15·25	3·50	0·50	10·75	0·00	...	...	5·8	4·1	14	2·41	...
38·8	·236	2·7	0·5	84·2	544·1	9·00	7·25	6·25	8·50	0·00	...	...	6·4	4·3	17	3·56	...
48·0	·344	3·9	0·8	82·8	536·1	110·00	74·00	58·00	122·00	0·00	...	...	6·0	5·1	158	18·85	...

Long. 2° 6′ W. Height above Sea 72½ feet.

40·7	·253	2·9	0·5	85·0	...	0·90	4·50	18·50	6·00	2·00	...	...	5·6	5·9	13	1·30	...
44·3	·297	3·3	0·5	87·4	...	5·00	1·50	8·50	12·00	1·00	...	...	5·7	5·2	10	1·74	...
37·5	·224	2·6	0·7	77·8	...	13·50	9·00	3·50	5·00	0·00	...	...	7·2	5·3	17	1·93	...
49·6	·356	4·0	0·9	82·3	...	5·00	5·00	6·50	9·50	4·00	...	...	3·1	6·9	11	2·77	...
53·1	·404	4·6	0·7	85·8	...	3·00	12·75	5·00	10·25	0·00	...	...	5·0	7·1	19	3·42	...
54·4	·424	4·7	1·6	73·6	...	7·25	9·00	4·00	9·75	0·00	...	...	3·3	6·5	7	·75	...
59·3	·531	5·6	2·4	68·9	...	6·50	10·00	4·25	10·25	0·00	...	...	5·2	5·5	2	·03	...
57·4	·473	5·1	1·7	69·0	...	8·75	9·00	3·00	9·75	0·50	...	...	3·1	6·5	7	·37	...
56·5	·457	5·0	1·7	75·0	...	2·25	4·00	9·75	13·50	0·50	...	...	5·8	6·4	19	2·45	...
49·8	·359	4·0	1·1	78·6	533·0	9·25	7·00	5·25	9·50	0·00	...	...	6·4	6·8	20	3·52	...
44·9	·298	3·4	0·7	82·4	543·5	7·00	2·00	7·75	12·75	0·50	...	...	6·7	6·8	21	2·84	...
33·3	·191	2·2	1·8	54·2	541·6	9·75	6·00	6·75	8·50	0·00	...	...	7·2	6·2	22	3·20	...
48·4	·355	3·9	1·2	76·6	...	77·25	79·75	82·75	116·75	8·50	...	...	5·3	6·3	168	24·8	...

Long. 1° 20′ W. Height above Sea 47 feet.

40·5	·252	2·9	0·4	87·2	550·9	1·50	6·75	12·75	10·00	0·00	...	259·5	8·0	4·6	15	2·89	2·12
42·4	·271	3·1	0·6	84·1	546·9	3·00	1·25	7·25	16·50	0·00	...	377·8	7·7	4·8	14	1·81	1·12
34·5	·200	2·3	0·8	76·5	550·0	14·75	8·50	1·75	6·00	0·00	...	289·0	8·7	4·4	11	1·75	1·48
45·3	·301	3·4	1·3	72·0	539·4	7·25	5·75	8·50	8·50	0·00	...	244·0	6·6	5·3	7	0·53	0·43
46·6	·317	3·6	1·2	74·0	535·1	4·75	10·50	8·75	6·50	0·50	...	244·4	8·4	5·9	17	4·65	4·03
50·6	·368	4·1	1·9	68·7	533·3	7·25	3·75	8·75	10·25	0·00	...	172·6	6·4	4·1	8	1·78	1·65
56·4	·457	5·0	2·5	66·5	526·2	5·25	3·75	12·75	9·25	0·00	...	191·7	5·5	3·8	3	1·12	1·08
54·2	·421	4·7	2·4	65·6	528·8	8·25	5·00	7·25	10·50	0·00	...	197·3	5·9	4·5	5	0·63	0·25
53·8	·416	4·6	1·6	75·9	527·3	1·50	4·25	9·00	15·25	0·00	...	352·0	7·3	3·9	17	4·61	3·91
46·7	·319	3·6	0·9	78·9	541·3	10·50	3·50	6·25	10·75	0·00	...	190·8	7·0	3·9	6	1·47	1·25
42·4	·271	3·1	0·5	86·7	547·4	9·25	1·25	4·75	14·75	0·00	...	320·6	7·4	3·0	7	1·19	0·98
37·7	·227	2·6	0·2	94·4	552·4	10·00	4·75	5·00	10·25	1·00	...	316·3	7·2	2·5	12	3·20	2·43
45·9	·318	3·6	1·2	77·5	539·9	83·25	59·00	92·75	128·50	1·50	...	255·0	7·2	4·1	122	25·69	20·73

* For 30 days only. † Anemometer broken on 2nd March. ‡ Rain gauge broken.

Appendix

PARKHURST, ISLE OF WIGHT. Lat. 50° 45′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	...	...	...	58·0	24·0	34·0	49·3	36·7	12·6	43·0	60·5	27·0	45·1	42·3
February	...	...	...	60·0	28·0	32·0	53·0	38·8	14·2	45·9	70·0	23·7	48·3	45·4
March	...	...	...	60·0	24·0	36·0	46·6	32·5	14·1	39·5	70·1	23·0	42·3	39·9
April	...	...	...	74·0	26·0	48·0	61·4	39·2	22·2	50·3	103·2	21·8	57·4	51·5
May	...	...	...	66·2	31·0	35·2	61·1	41·7	19·4	51·4	103·0	34·7	56·1	52·7
June	...	...	...	79·6	36·0	43·6	67·4	42·9	24·5	55·1	114·2	33·3	62·5	57·5
July	...	...	...	88·0	44·0	44·0	74·6	50·5	24·1	62·6	116·7	40·0	68·5	63·1
August	...	...	...	85·0	39·0	46·0	72·3	48·1	24·2	60·2	112·9	36·0	67·0	62·3
September	...	...	..	75·0	38·0	37·0	68·4	50·1	18·3	59·2	99·5	39·1	63·5	59·9
October	...	...	...	78·0	26·4	51·6	59·9	41·0	18·9	50·5	76·3	33·9	54·4	51·8
November	...	...	...	63·0	22·4	40·6	53·9	35·7	18·2	44·8	66·9	32·5	47·7	45·8
December	...	...	...	54·0	15·0	39·0	43·3	31·5	11·8	37·4	52·5	30·4	39·8	38·6
Yearly Sums, Means, and Totals ...	...	...	...	79·1	29·5	46·6	59·2	40·7	18·5	49·9	87·1	32·5	54·4	50·9

PORTSMOUTH. Lat. 50° 45′ N.

January	30·027	30·542	29·058	55·5	26·5	29·0	48·9	37·1	11·8	43·0	60·6	33·1	44·7	42·6
February	29·992	30·440	29·032	57·0	30·8	26·2	52·3	40·1	12·2	46·2	74·5	36·4	48·5	45·1
March	29·782	30·240	29·226	55·1	26·8	28·3	46·7	32·1	14·6	39·4	80·0	28·6	41·8	38·0
April	29·960	30·303	29·161	75·1	29·6	45·5	59·4	41·4	18·0	50·4	102·8	37·3	53·3	48·8
May	29·761	30·193	29·131	65·1	36·0	29·1	60·4	44·2	16·2	52·3	109·3	40·9	54·4	50·7
June	30·080	30·502	29·423	80·6	41·2	38·8	67·3	47·3	20·0	57·3	121·2	41·6	60·7	54·6
July	30·108	30·472	29·823	84·2	48·0	36·2	73·5	53·3	20·2	63·4	125·2	45·7	67·2	60·5
August	30·146	30·409	29·648	82·8	42·4	40·4	72·4	51·6	20·8	62·0	114·0	42·2	66·0	59·2
September	29·840	30·413	29·273	73·2	43·0	30·2	66·9	51·7	15·2	59·3	102·2	43·0	62·4	56·7
October	30·056	30·516	29·385	75·2	29·9	46·2	58·6	43·0	15·6	50·8	84·0	37·8	53·3	49·5
November	30·022	30·534	29·213	58·2	25·2	33·0	52·6	37·4	15·2	45·0	63·0	28·1	47·4	44·5
December	29·814	30·516	29·365	55·5	19·5	36·0	44·2	32·3	11·9	38·2	51·6	23·3	40·2	38·9
Yearly Sums, Means, and Totals ...	29·965	30·423	29·311	68·1	33·2	34·9	58·6	42·6	16·0	50·6	90·7	36·5	53·3	49·0

PRESTON. Lat. 53° 45′ N.

January	...	...	...	54·5	18·9	35·6	48·3	32·5	15·8	40·4	...	...	43·0	40·9
February	...	...	...	59·5	25·0	34·5	52·3	35·2	17·1	43·7	...	...	47·4	44·3
March	...	...	...	57·0	20·0	37·0	48·7	27·6	21·1	38·1	...	...	43·3	38·4
April	..	...	...	78·0	25·5	52·5	60·7	36·9	23·8	48·3	...	...	54·9	49·3
May	...	...	...	64·0	25·0	39·0	57·5	35·3	22·2	46·4	...	...	52·2	47·2
June	...	...	...	82·0	27·0	55·0	66·7	41·8	24·9	54·2	...	...	59·9	54·2
July	...	...	...	86·5	32·0	54·5	74·0	46·5	27·5	60·2	...	...	68·0	61·6
August	...	...	...	89·0	26·0	63·0	69·5	41·3	28·2	55·4	...	...	62·8	57·7
September	...	...	...	74·0	28·0	46·0	63·4	41·0	27·4	54·7	...	...	58·9	55·8
October	...	...	...	78·0	23·0	55·0	67·9	37·7	30·2	52·8	...	...	52·3	49·9
November	...	...	...	69·0	20·5	48·5	64·5	30·8	33·7	47·6	...	...	43·6	42·0
December	...	...	...	65·0	4·0	61·0	64·0	26·3	37·7	45·2	...	...	37·8	36·8
Yearly Sums, Means, and Totals ...	...	...	...	71·3	22·9	48·4	61·9	36·1	25·8	49·0	...	...	52·0	48·2

No. XXXI—*continued.*

Long. 1° 16′ W. Height above Sea 200 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.										
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	Feet above the und.
											lbs. per sq. foot	Miles				Inches	Inches
39·0	·238	2·7	0·7	79·5	...	1·00	3·25	12·75	13·00	*1·00	...	...	8·0	3·8	12	2·58	...
42·2	·289	3·1	0·8	80·0	...	4·75	0·25	6·00	17·00	0·00	...	...	6·3	5·2	15	2·56	...
36·9	·220	2·5	0·6	82·2	...	12·75	0·75	1·00	16·50	0·00	...	...	7·4	4·2	12	3·03	...
46·4	·312	3·5	1·8	65·9	...	3·50	5·25	9·50	11·25	0·50	...	...	5·9	4·9	8	1·37	...
49·5	·353	4·0	1·0	78·7	...	3·75	7·25	10·50	9·00	0·50	...	...	7·2	5·4	15	4·60	...
53·2	·409	4·5	1·8	72·0	...	3·75	5·75	11·50	9·00	0·00	...	...	5·5	5·1	7	2·11	...
58·9	·497	5·5	2·2	71·0	...	1·50	8·75	12·25	8·00	0·50	...	...	4·8	4·9	3	1·12	...
58·5	·493	5·4	1·9	74·5	...	2·50	6·50	7·50	13·50	1·00	...	...	4·6	5·1	4	0·53	...
56·9	·465	5·1	1·7	79·5	...	2·50	2·50	10·00	15·00	0·00	...	...	6·1	5·5	14	5·20	...
49·3	·360	4·0	0·8	82·4	...	10·50	0·75	7·25	12·00	0·50	...	...	5·9	4·9	11	2·72	...
43·7	·285	3·2	0·5	87·4	...	7·75	1·50	2·75	16·50	1·50	...	...	7·1	5·3	10	1·75	...
37·0	·221	2·4	0·4	90·4	...	7·25	8·00	4·00	10·75	1·00	...	...	7·8	4·1	11	2·56	...
47·6	·344	3·8	1·2	78·6	...	61·50	50·50	95·00	151·50	6·50	...	...	6·4	4·9	122	38·18	...

Long. 1° 5′ W. Height above Sea 20 feet.

																*
40·1	·249	2·8	0·5	84·6	551·3	0·75	8·25	13·25	8·75	0·00	...	159·7	7·3	1·3	16	3·04	3·00
41·4	·261	3·0	0·9	76·7	547·5	2·25	2·25	9·25	14·25	0·00	...	197·6	6·4	1·6	18	1·97	1·99
33·3	·191	2·2	0·9	73·0	550·4	14·25	8·00	2·00	6·75	0·00	...	204·4	7·2	3·0	10	1·74	1·67
44·3	·292	3·3	1·2	71·5	540·6	4·50	8·00	6·75	9·75	1·00	...	166·24	5·3	2·3	10	1·01	1·09
47·1	·323	3·7	1·1	76·2	535·7	6·75	11·00	7·00	5·25	1·00	...	161·29	6·5	3·0	17	4·39	4·31
49·3	·352	3·9	2·0	66·2	534·6	6·50	5·75	6·25	8·50	3·00	...	105·28	4·8	1·8	8	1·65	1·58
55·2	·486	4·8	2·5	65·2	527·9	4·50	9·00	9·25	7·25	1·00	...	112·58	5·5	2·0	3	1·64	1·58
53·7	·412	4·6	2·4	64·8	530·0	4·75	7·00	5·25	12·00	2·00	...	156·23	4·5	1·7	6	0·75	0·75
51·8	·396	4·3	2·0	68·9	528·5	1·25	4·75	9·00	13·50	1·50	...	182·79	6·3	1·6	15	4·59	3·77
45·7	·307	3·5	1·1	75·5	542·1	7·25	5·00	5·75	13·00	0·00	...	130·72	5·9	1·3	14	2·66	2·48
41·3	·260	3·0	0·7	80·1	548·2	7·75	1·00	3·75	14·00	3·50	...	131·79	7·0	0·6	10	1·51	1·39
35·2	·205	2·4	0·5	82·6	552·6	10·50	4·00	6·25	8·25	2·00	...	155·9	7·5	0·9	12	2·92	2·72
44·9	·306	3·4	1·3	73·8	540·8	71·00	74·00	83·75	121·25	15·00	...	155·37	6·2	1·7	136	27·87	26·24

Long. 2° 40′ W. Height above Sea 220 feet.

38·4	·232	2·7	0·5	83·4	...	6·00	6·75	8·25	8·50	1·50	...	...	3·7	1·1	18	3·74	...
40·8	·255	2·9	0·8	78·7	...	1·50	1·50	9·75	14·25	1·00	...	...	4·0	2·1	21	7·36	...
33·2	·189	2·2	1·0	67·4	...	12·75	6·25	3·00	8·00	1·00	...	...	3·5	2·3	8	0·89	...
43·9	·287	3·3	1·6	66·0	...	4·00	3·00	4·75	12·25	6·00	...	...	4·0	1·6	13	2·64	...
42·1	·268	3·0	1·4	69·0	...	3·00	16·25	2·25	6·00	3·50	...	...	4·3	2·7	16	4·04	...
49·2	·350	3·9	1·9	67·5	...	1·75	0·50	1·75	16·50	9·50	...	...	4·2	2·2	10	1·99	...
56·6	·458	5·0	2·5	66·4	...	0·00	1·00	5·00	14·00	11·00	...	...	4·8	2·1	8	1·19	...
53·4	·409	4·5	1·8	71·5	...	1·25	2·25	3·25	15·75	8·50	...	...	5·4	3·9	8	1·42	...
53·0	·404	4·5	1·1	81·3	...	9·00	12·50	1·25	3·75	3·50	...	...	5·2	2·4	24	7·81	...
47·5	·329	3·7	0·7	83·9	...	7·25	13·50	0·50	2·75	7·00	...	...	4·2	2·3	18	3·29	...
40·1	·248	2·8	0·4	87·2	...	11·25	3·25	0·00	5·50	10·00	...	...	4·2	2·5	21	4·28	...
35·5	·208	2·5	0·2	91·8	...	7·00	7·50	0·75	4·75	11·00	...	...	4·0	1·8	15	5·13	...
44·5	·303	3·4	1·1	76·2	...	64·75	74·25	40·50	112·00	73·50	...	...	4·3	2·2	180	43·76	...

* 20 feet above the ground.

Appendix

SHEERNESS. Lat. 51° 23′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	...	...	...	56·0	22·0	34·0	47·0	31·4	15·6	39·2	...	...	42·0	40·0
February	...	...	...	60·0	29·0	21·0	52·1	36·0	16·1	44·0	...	...	47·1	44·4
March	...	...	...	54·0	28·0	26·0	45·2	30·8	14·4	38·0	...	...	39·9	35·8
April	...	...	...	76·0	30·0	46·0	58·9	28·5	20·4	48·7	...	...	52·6	48·9
May	...	...	...	68·0	35·0	33·0	61·3	41·9	19·4	51·6	...	...	54·6	50·7
June	...	...	...	64·0	38·0	46·0	68·2	44·3	23·9	56·2	...	...	60·3	55·8
July	...	...	...	87·0	44·0	43·0	74·4	50·0	24·4	62·2	...	...	66·6	61·6
August...	...	...	...	80·0	40·0	40·0	71·0	48·6	22·4	59·8	...	...	63·9	58·1
September	...	...	...	76·0	40·0	36·0	68·8	47·3	21·5	58·0	...	...	62·5	56·6
October...	...	...	...	70·0	28·0	42·0	59·0	41·8	17·2	50·4	...	...	53·0	47·8
November	...	...	...	53·0	25·0	33·0	50·7	33·3	17·4	42·0	...	...	44·5	40·1
December	...	...	...	56·0	28·0	33·0	44·8	30·8	14·0	37·8	...	...	39·2	35·0
Yearly Sums, Means and Totals ...	...	...	...	68·7	31·4	37·3	58·4	39·5	18·9	48·9	...	...	52·2	47·9

SHORNCLIFFE CAMP. Lat. 51° 5′ N.

January	29·904	30·398	29·842	56·8	19·0	37·8	48·8	29·2	19·6	39·0	62·1	29·2	42·0	40·4
February	29·789	30·227	28·728	58·4	20·0	38·4	51·8	28·4	23·4	40·1	78·0	33·0	46·1	44·0
March	29·366	30·011	28·947	55·0	18·0	37·0	45·8	24·4	21·4	35·1	83·5	25·4	36·2	36·7
April	29·834	30·189	29·125	79·0	23·0	56·0	58·3	34·9	23·4	46·6	109·2	31·3	50·6	47·4
May	29·611	30·093	28·993	68·0	30·0	38·0	58·4	38·6	19·8	48·5	113·5	45·0	52·6	49·0
June	29·939	30·174	29·396	76·4	33·4	43·0	64·7	41·1	23·6	52·9	119·0	44·3	56·5	52·4
July	29·964	30·288	29·717	86·6	43·6	43·0	74·3	49·6	24·7	61·9	126·4	54·7	65·6	61·0
August...	29·990	30·221	29·481	87·0	40·0	47·0	71·8	47·3	24·5	59·5	119·3	50·9	63·2	59·8
September	29·720	30·274	28·984	77·0	38·2	38·8	69·2	46·2	23·0	57·7	115·7	50·6	61·3	58·8
October...	29·890	30·287	29·235	72·4	28·0	49·4	58·6	38·0	20·6	48·3	97·0	44·9	51·9	48·7
November	29·809	30·425	29·141	58·0	22·0	36·0	50·8	32·8	18·0	41·8	65·2	44·1	44·8	42·5
December	29·676	30·458	29·252	54·4	17·4	37·0	46·3	29 5	16·8	37·9	61·3	42·3	38·5	37·1
Yearly Sums, Means, and Totals ...	29·808	30·254	29·234	69·0	27·3	41·7	58·2	36·6	21·6	47·4	95·8	41·5	51·0	48·1

WINCHESTER. Lat. 51° 4′ N.

January	...	...	...	57·5	21·5	36·0	48·9	33·9	15·0	41·4	...	...	43·2	42·0
February	...	...	...	58·5	27·5	31·0	52·5	37·5	15·0	45·0	...	...	47·1	45·0
March	...	...	...	67·0	25·0	32·0	47·1	30·7	16·4	38·9	...	...	41·3	38·7
April	...	...	...	77·0	25·0	52·0	63·0	39·6	23·4	51·3	...	...	55·2	50·8
May	...	...	...	68·5	30·0	38·5	61·3	41·1	20·2	51·2	...	...	54·1	50·9
June	...	...	...	83·0	36·0	47·0	68·3	43·5	24·8	55·9	...	...	61·4	56·5
July	...	...	...	90·5	41·0	49·5	77·3	49·5	27·8	63·4	...	...	69·3	63·2
August	...	...	...	90·3	36·5	54·0	74·2	47·2	27·0	60·7	...	...	66·7	60·6
September	...	...	...	78·0	38·0	40·0	68·2	48·4	19·8	58·3	...	...	61·7	57·5
October...	...	...	...	77·0	27·0	50·0	59·1	39·9	19·2	49·5	...	...	52·9	50·1
November	...	...	...	68·5	21·0	47·5	52·2	33·8	18·4	43·0	...	...	45·4	43·3
December	...	...	...	56·0	15·0	41·0	43·2	29·3	13·9	36·2	...	...	38·4	36·9
Yearly Sums, Means, and Totals ...	...	...	...	71·8	28·6	43·2	59·6	39·5	20·1	49·5	...	...	53·1	49·6

No. XXXI—continued.

Long. 0° 49′ E. Below the Sea Level 2 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
37·5	·225	2·6	0·5	85·0	...	3·25	4·75	12·25	10·75	0·00	...	...	5·2	2·4	9	0·96	...
41·4	·261	3·0	0·7	81·2	...	1·75	1·50	12·25	12·50	0·00	...	...	6·4	3·3	8	0·59	...
30·5	·170	2·0	0·9	69·3	...	12·25	10·75	3·75	4·25	0·00	...	...	6·6	3·0	5	0·32	...
45·2	·302	3·4	1·1	76·4	...	8·25	8·00	6·75	7·00	0·00	...	...	4·4	3·4	7	0·53	...
47·0	·321	3·6	1·2	75·2	...	10·50	10·25	5·50	4·75	0·00	...	...	5·8	3·4	12	0·76	...
51·9	·386	4·3	1·5	73·5	...	5·50	4·75	9·75	10·00	0·00	...	...	4·5	3·4	4	0·32	...
57·6	·476	5·3	1·9	73·6	...	7·00	6·50	8·50	9·00	0·00	...	...	3·7	3·8	3	0·13	...
53·3	·407	4·5	2·0	68·9	...	4·50	7·50	7·75	11·25	0·00	...	...*	4·6	3·1	7	1·32	...
51·5	·383	4·2	2·1	68·0	...	3·50	1·00	7·75	17·75	0·00	...	...	4·6	2·5	11	1·76	...
42·6	·273	3·1	1·4	68·0	...	7·00	2·75	3·25	18·00	0·00	...	...	5·1	3·3	8	1·79	...
35·0	·203	2·4	1·0	69·1	...	5·75	1·50	1·50	21·25	0·00	...	...	5·2	4·3	8	1·50	...
29·5	·162	1·9	0·9	68·6	...	7·00	12·25	2·75	9·00	0·00	...	...	6·4	5·5	11	1·82	...
43·6	·297	3·4	1·3	73·1	...	76·25	71·50	81·75	135·50	0·00	...	...	5·3	3·5	93	11·80	...

Long. 1° 10′ E. Height above Sea 220 feet.

38·4	·233	2·7	0·4	87·8	552·1	2·00	4·25	14·00	9·25	1·50	...	...	6·6	3·9	13	2·16	1·05
41·6	·264	3·1	0·5	85·3	545·2	4·00	0·75	4·50	17·75	1·00	...	372·4	6·7	4·5	15	2·79	1·66
38·4	·192	2·2	0·6	80·5	549·1	13·50	8·25	3·75	4·50	1·00	...	489·9	6·9	4·2	10	2·94	1·36
44·0	·289	3·3	0·8	78·8	541·2	7·75	5·50	7·00	5·25	4·50	...	392·8	5·2	4·3	9	1·61	0·37
45·4	·303	3·4	1·1	77·0	535·1	8·00	9·25	6·50	6·25	1·00	...	...	6·3	5·1	19	5·16	3·30
48·6	·343	3·9	1·2	74·9	536·3	10·25	2·75	5·75	8·25	3·00	...	...	5·2	4·9	7	0·84	0·40
57·2	·470	5·2	1·7	75·0	526·8	5·25	5·50	9·00	4·75	6·50	...	...	4·0	4·3	3	0·18	*0·07
57·7	·465	5·1	1·3	80·2	529·7	7·75	8·00	4·75	9·50	1·00	...	...	4·7	4·9	11	2·17	1·36
56·7	·460	5·1	1·0	85·3	526·9	3·00	3·00	7·50	16·00	0·50	...	...	5·5	5·6	13	2·26	0·95
45·5	·306	3·4	0·9	78·8	540·7	8·25	4·00	6·75	11·50	0·50	...	...	5·0	5·5	11	2·04	1·14
39·8	·246	2·8	0·6	83·2	547·1	9·25	0·25	4·25	15·75	0·50	...	...	6·8	5·8	14	2·28	1·61
35·2	·205	2·4	0·3	88·4	551·9	11·75	3·75	8·25	6·75	0·50	...	...	7·5	5·1	17	2·50	1·54
45·3	·315	3·5	0·9	81·3	540·2	90·75	55·25	82·00	115·50	21·50	...	...	5·9	4·9	142	26·87	15·51

Long. 1° 20′ W. Height above Sea 214 feet.

40·5	·253	2·9	0·3	90·4	...	1·25	9·00	13·25	7·50	0·00	...	...	6·1	2·5	16	3·74	...
42·7	·274	3·2	0·5	85·4	...	3·25	0·75	8·75	15·25	0·00	...	...	7·4	5·2	16	2·72	...
35·5	·208	2·4	0·6	80·4	...	13·00	11·25	2·75	4·00	0·00	...	...	6·1	5·2	8	1·24	...
46·6	·319	3·6	1·3	73·0	...	5·75	9·25	8·50	6·50	0·00	...	...	6·2	5·8	12	1·37	...
47·8	·331	3·8	1·0	78·9	...	6·00	12·25	7·25	5·50	0·00	...	...	7·9	5·5	16*	3·68	...
52·3	·392	4·4	1·3	72·5	...	7·50	8·00	6·50	8·00	0·00	...	...	6·1	6·1	10	1·72	...
53·4	·495	5·3	2·5	67·8	...	4·00	7·50	9·50	10·00	0·00	...	...	5·3	6·4	5	0·85	...
55·7	·444	4·9	2·3	68·2	...	8·25	10·00	4·25	8·50	0·00	...	...	5·0	6·5	9	1·67	...
53·9	·416	4·6	1·5	76·0	...	2·00	4·50	12·25	11·25	0·00	...	...	6·9	6·4	16	4·63	...
47·3	·327	3·6	0·8	81·3	...	9·00	5·75	6·50	9·75	0·00	...	...	5·9	4·6	10	3·20	...
40·9	·256	2·9	0·6	84·7	...	8·75	1·00	6·25	14·00	0·00	...	...	6·9	4·8	11	1·77	...
34·8	·203	2·3	0·4	87·8	...	10·25	6·50	7·00	7·25	0·00	...	...	6·9	5·1	17	3·64	...
46·6	·326	3·6	1·1	78·9	...	79·00	85·75	92·75	107·50	0·00	...	...	6·4	5·3	146	30·23	...

* 20 feet above the ground.

Appendix

WOOLWICH. Lat. 51° 29′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean Of all the highest.	Mean Of all the lowest.	Mean Daily Range.	Mean Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Hygrometer. Dry Bulb.	Hygrometer. Wet Bulb.
January	29·662	30·170	28·774	55·3	23·7	32·1	46·9	32·0	14·9	39·4	52·9	30·0	42·3	40·3
February	29·651	30·027	28·724	59·0	28·7	30·3	50·8	36·3	14·5	43·5	70·7	35·7	47·1	45·1
March	29·461	29·920	28·845	51·0	19·7	31·3	43·6	29·0	14·6	36·3	75·2	27·0	39·7	37·7
April	29·662	29·980	28·983	79·3	26·7	52·6	61·0	39·1	21·9	50·0	101·1	38·1	56·2	52·3
May	29·503	29·862	28·877	79·7	30·0	49·7	60·3*	40·6*	19·7*	50·4*	105·3	40·7	55·4	51·6
June	29·749	29·970	29·105	84·2	32·3	51·9	65·9	45·1	20·8	55·5	114·3	40·5	61·5	55·7
July	29·760	30·083	29·503	89·5	44·3	45·2	76·0	51·2	24·8	63·6	127·4	49·5	69·9	63·5
August	29·798	30·028	29·324	88·9	39·9	49·0	72·6	48·5	24·1	60·5	116·5	44·9	67·6	61·9
September	29·492	30·053	28·923	77·8	35·5	42·3	69·2	47·1	22·1	58·1	102·3	44·9	62·6	58·7
October...	29·698	30·129	28·934	78·3	24·0	54·3	57·7	39·5	18·2	48·6	72·1	34·4	52·6	49·6
November	29·609	30·138	29·152	63·0	21·2	41·8	49·7	33·4	16·3	41·5	52·9	30·4	45·8	43·0
December	29·481	30·209	28·183	54·7	11·0	43·7	42·1	29·8	12·3	35·9	45·6	27·5	39·3	37·4
Yearly Sums, Means, and Totals ...	29·627	30·047	28·944	71·0	28·2	42·8	58·0	39·3	18·7	48·6	86·4	37·0	53·3	49·7

EDINBURGH. Lat. 57° 57′ N.

January	29·210	29·952	28·164	56·5	30·5	26·0	46·8	36·6	10·2	41·7	51·6	29·6	42·6	40·2
February	29·089	29·621	28·303	54·0	28·0	26·0	50·1	37·5	12·6	43·8	60·4	27·8	44·4	42·5
March	29·315	29·947	28·444	58·9	26·0	32·0	47·2	33·8	13·4	40·5	69·3	24·0	40·3	37·5
April	29·370	30·081	28·600	70·0	34·0	36·0	59·1	41·9	17·2	50·5	92·8	30·0	52·6	48·4
May	29·358	29·832	28·610	64·0	34·0	30·0	55·9	38·7	17·2	47·3	87·2	29·0	49·8	46·1
June	29·533	29·895	28·935	78·0	34·0	44·0	64·8	46·8	18·0	55·8	91·4	36·4	58·8	54·4
July	29·486	29·851	29·069	79·0	45·0	34·0	70·5	51·9	18·6	61·2	102·4	†	64·1	58·2
August	29·599	29·940	28·988	83·0	35·0	48·0	69·3	48·7	20·6	59·0	99·8	†	63·0	56·7
September	29·143	30·023	28·594	72·0	43·0	29·0	64·1	48·4	15·7	56·2	86·5	†	58·4	55·2
October...	29·461	29·921	28·654	67·0	28·0	39·0	55·0	41·6	13·4	48·3	70·8	37·7	49·6	46·2
November	29·281	29·887	28·691	55·0	27·0	28·0	45·4	33·4	12·0	39·4	52·9	32·1	41·7	38·9
December	29·205	29·773	29·205	50·0	23·0	27·0	41·7	31·6	10·1	36·6	43·3	29·1	38·0	35·7
Yearly Sums, Means, and Total ...	29·337	29·927	28·668	66·3	32·2	34·1	55·8	40·9	14·9	48·3	75·6	30·6	50·3	46·6

* On 19 days, from 13th to 31st.

† Minimum Thermometer stolen.

No. XXXI—continued.

Long. 0° 4′ E. Height above Sea 145 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	20 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
37·8	·228	2·6	0·5	85·0	547·3	0·25	3·25	8·50	19·00	0·00	...	163·6	5·3	3·1	15	2·16	1·90
42·9	·276	3·2	0·5	86·1	541·7	1·50	1·00	5·00	20·50	0·00	...	167·2	5·6	2·2	19	2·44	2·14
35·1	·205	2·4	0·5	84·0	546·7	17·00	4·00	1·75	8·25	0·00	...	179·4	6·3	1·6	15	1·90	1·79
48·6	·344	3·8	1·2	75·8	531·8	2·75	7·00	7·50	12·75	0·00	...	148·7	4·3	2·3	9	1·57	1·40
48·0	·336	3·8	1·2	76·6	529·8	3·25	13·00	5·75	8·50	0·50	...	151·4	5·6	2·6	17	3·45	3·14
50·7	·370	4·2	1·9	68·5	527·6	7·75	2·00	4·75	15·50	0·00	...	131·5	5·1	3·2	9	1·33	1·16
58·6	·507	5·4	2·6	66·9	518·9	6·50	5·25	4·25	15·00	0·00	...	128·8	4·3	2·6	3	0·54	0·52
57·4	·473	5·1	2·3	69·5	521·9	3·50	0·00	3·25	24·25	0·00	...	141·2	4·6	6·5	10	1·62	1·14
55·4	·440	4·9	1·4	77·5	521·7	1·50	0·00	6·75	21·75	0·00	...	166·2	5·5	3·7	13	2·33	2·18
46·6	·318	3·6	0·9	80·6	536·6	3·75	0·00	5·50	21·75	0·00	...	154·4	5·3	2·8	11	2·55	2·28
39·8	·246	2·8	0·7	80·2	542·4	3·25	0·75	7·50	18·50	0·00	...	149·9	7·7	2·7	12	2·49	2·28
34·9	·204	2·3	0·5	84·8	547·4	10·00	1·75	4·75	14·50	0·00	...	159·5	6·6	3·0	13	2·91	2·67
46·3	·329	3·7	1·2	77·9	534·5	61·00	38·00	65·25	200·25	0·50	...	153·5	5·5	3·0	146	25·19	22·60

Long. 3° 11′ W. Height above Sea 402 feet.

37·3	·223	2·6	0·6	82·2	538·7	3·00	5·75	13·00	9·25	0·00	...	161·9	7·0	0·4	13	1·96	1·66
40·2	·250	2·8	0·5	85·6	534·3	6·25	2·25	7·50	12·00	0·00	...	201·6	6·5	0·4	23	3·57	3·01
33·9	·195	2·3	0·7	78·2	543·4	12·50	8·00	2·50	8·00	0·00	...	121·2	5·9	*	10	1·00	0·86
44·2	·290	3·3	1·2	73·4	530·8	6·75	4·50	8·25	10·00	0·50	...	135·2	4·8	1·1	6	0·77	0·64
42·2	·269	3·0	1·0	74·9	533·4	10·75	13·50	4·25	2·50	0·00	...	126·1	5·7	1·5	10	2·44	2·23
50·4	·365	4·1	1·4	74·0	526·7	11·75	6·00	3·50	8·75	0·00	...	145·1	5·7	2·1	6	1·76	1·50
53·3	·407	4·5	2·1	67·6	520·2	4·25	4·00	8·75	14·00	0·00	...	186·0	9·6	5·8	8	0·78	0·61
51·4	·379	4·2	2·2	65·8	523·5	3·00	2·25	11·75	14·00	0·00	...	156·0	4·1	2·9	7	0·65	0·63
52·3	·393	4·4	1·1	80·2	520·1	5·25	1·25	7·25	16·25	0·00	...	231·8	5·3	3·1	20	4·04	3·70
42·6	·274	3·1	0·9	76·8	535·6	6·25	0·50	8·50	14·75	1·00	...	192·9	6·0	2·1	19	1·80	1·64
35·5	·208	2·4	0·7	79·8	541·1	6·25	0·00	5·25	18·00	0·50	...	220·5	5·4	2·9	14	1·36	1·13
32·5	·184	2·1	0·6	80·6	543·9	3·75	0·25	5·00	21·50	0·50	...	203·8	5·2	3·0	15	0·82	0·73
43·0	·286	3·2	1·1	76·6	532·6	79·75	48·25	85·50	149·00	2·50	...	173·9	5·9	2·1	151	20·95	18·43

* No Ozone Papers.

Appendix

Abstract of Results of Meteorological Observations

Stations, with their Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean.						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
Aldershot	29·495	29·910	29·867	90·2	25·0	65·2	58·9	42·1	16·8	50·5	90·7	39·7	52·4	48·5
Canterbury* 80 ft.	...	...	...	88·5	19·5	69·0	...	38·9	...	...	...	...	54·0	51·5
Chatham ... 160 ,,	29·813	30·258	29·114	88·6	15·4	73·2	57·1	40·1	17·0	48·6	84·1	36·6	52·3	48·6
Colchester ... 109 ,,	29·762	30·229	29·064	88·6	11·5	77·1	58·7	39·4	19·3	49·0	84·9	35·3	53·0	49·1
Devonport ... 35 ,,	29·752	30·185	29·097	89·2	9·3	79·4	61·0	41·0	20·0	51·0	96·7	34·5	55·0	50·9
Dover ... 325 ,,	...	...	...	83·0	20·0	63·0	55·5	39·9	15·6	47·7	...	...	51·6	48·0
Guernsey† ... 248 ,,	29·723	30·276	29·057	83·0	5·0	78·0	58·3	38·6	19·7	48·4	93·2	29·9	53·2	50·6
Jersey‡ .... 72·5 ,,	29·916	30·402	29·286	94·0	20·6	73·4	61·6	44·1	17·5	52·8	...	...	55·5	52·0
Netley§ ... 47 ,,	29·917	30·353	29·596	84·8	17·0	67·0	58·9	41·9	17·0	50·4	88·0	36·0	53·1	49·4
Parkhurst ... 200 ,,	...	...	...	88·0	15·0	73·0	59·2	40·7	18·5	49·9	87·1	32·5	54·4	50·9
Portsmouth 20 ,,	29·965	30·423	29·311	84·2	19·5	64·7	58·6	42·6	16·0	50·6	90·7	36·5	53·3	49·0
Preston ... 220 ,,	...	...	...	89·0	4·0	85·0	61·9	36·1	25·8	49·0	...	...	52·0	48·2
Sheerness 2 ft. below	...	...	...	87·0	22·0	65·0	58·4	39·5	18·9	48·9	...	...	52·2	47·9
Shorncliffe ... 220 ft.	29·808	30·254	29·234	87·0	17·4	69·6	58·2	38·6	21·6	47·4	95·8	41·5	51·0	48·1
Winchester... 214 ,,	...	...	...	90·5	15·0	75·5	59·6	39·5	20·1	49·5	...	...	53·1	49·6
Woolwich‖ ... 145 ,,	29·627	30·047	28·944	89·5	11·0	78·5	58·0	39·3	18·7	48·6	86·4	37·0	53·3	49·7
Edinburgh¶ 402 ,,	29·337	29·927	28·688	83·0	23·0	60·0	55·8	40·9	14·9	48·3	75·6	30·6	50·3	46·6

* Canterbury: Hygrometer calculations 6 days short in July.
† Guernsey: Wind registered only on 364 days.
‡ Jersey: Barometer in use from 7th October only.
§ Netley: Minimum on grass not in use during June.
‖ Woolwich: The mean, maximum, minimum, and range and temperature, are calculated for 353 days only.
¶ Edinburgh: Minimum on grass not recorded in July, August, and September.

No. XXXI—*continued.*

taken at Stations in England and Scotland in the year 1869.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.													
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.								
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rain fall on the Ground.	Latitude.		Longitude.		
											lbs. per sq. foot	Miles				Inches	°	′	°	′
44·9	·308	3·4	1·2	76·6	533·2	82·00	62·50	98·00	122·50	0·00	...	280·3	7·5	2·5	164	29·17	51	15 N.	0	45 W.
49·1	·365	4·1	0·3	92·7	...	73·50	58·50	63·50	147·50	22·00	...	...	3·4	3·4	119	25·81	51	17 ,,	1	5 E.
45·1	·312	3·5	1·2	77·5	539·0	52·00	72·75	94·25	136·50	9·50	...	235·9	7·1	2·0	187	31·48	51	23 ,,	0	32 ,,
45·5	·314	3·5	1·2	76·7	537·0	80·00	65·00	97·25	121·75	1·00	...	185·8	7·4	3·2	146	23·39	50	53 ,,	0	54 ,,
47·0	·332	3·7	1·3	75·1	535·0	73·75	83·50	91·00	110·75	6·00	...	274·7	6·7	4·8	170	36·90	50	17 ,,	4	5 W.
44·3	·304	3·4	1·1	77·0	...	69·75	86·00	77·75	129·50	2·00	...	...	6·0	4·5	148	26·21	51	8 ,,	1	19 E.
48·0	·344	3·9	0·8	82·8	536·1	110·00	74·00	58·00	122·00	0·00	...	...	6·0	5·1	158	18·85	49	33 ,,	2	40 W.
48·4	·355	3·9	1·2	76·6	541·0	77·25	79·75	82·75	116·75	8·50	...	...	5·3	6·3	168	24·8	49	11 ,,	2	6 ,,
45·9	·318	3·6	1·2	77·5	539·9	83·25	59·00	92·75	128·50	1·50	...	255·0	7·2	4·1	122	25·69	50	51 ,,	1	20 ,,
47·6	·344	3·8	1·2	78·6	...	61·50	50·50	95·00	151·50	6·50	...	...	6·4	4·9	122	38·18	50	45 ,,	1	16 ,,
44·9	·306	3·4	1·3	73·8	540·8	71·00	74·00	83·75	121·25	15·00	...	155·37	6·2	1·7	136	27·87	50	45 ,,	1	5 ,,
44·5	·303	3·4	1·1	76·2	...	64·75	74·25	40·50	112·00	73·50	...	...	4·3	2·2	180	43·76	53	45 ,,	2	40 ,,
43·6	·297	3·4	1·3	73·1	...	76·25	71·50	81·75	135·50	0·00	...	...	5·3	3·5	93	11·80	51	23 ,,	0	49 E.
45·3	·315	3·5	0·9	81·3	540·2	90·75	55·25	82·00	115·50	21·50	...	...	5·9	4·9	142	26·87	51	5 ,,	1	10 ,,
46·6	·326	3·6	1·1	78·9	...	79·00	85·75	92·75	107·50	0·00	...	...	6·4	5·3	146	30·23	51	4 ,,	1	29 W.
46·3	·329	3·7	1·2	77·9	534·5	61·00	38·00	65·25	200·25	0·50	...	153·5	5·5	3·0	146	25·19	51	29 ,,	0	4 E.
43·0	·286	3·2	1·1	76·6	532·6	79·75	48·25	85·50	149·00	2·50	...	173·5	5·9	2·1	151	20·95	57	57 ,,	3	11 W.

Appendix

Abstract of Results of Meteorological Observations

ATHLONE. Lat. 53° 26′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	...	...	...	55·0	40·0	15·0	48·6	34·9	13·7	41·7	...	...	44·3	42·6
February	...	...	...	58·5	29·0	29·5	51·7	36·0	15·7	43·8	...	...	47·0	44·9
March	...	...	...	55·0	24·0	31·0	49·5	32·1	17·4	40·8	...	...	43·4	41·1
April	...	...	...	72·5	31·0	41·5	59·6	39·4	20·2	49·5	...	...	53·5	49·5
May	...	...	...	70·0	32·0	38·0	57·5	39·1	18·4	48·3	...	...	52·7	48·7
June	...	...	...	82·0	33·0	49·0	67·8	45·0	22·8	56·4	...	...	61·4	55·9
July	...	...	...	86·5	42·6	43·9	74·3	50·5	23·8	62·4	...	...	66·7	60·4
August	...	...	...	91·5	36·8	54·7	71·5	47·0	24·5	59·2	...	...	64·5	59·0
September	...	...	...	73·8	36·1	37·7	65·2	45·4	19·8	55·3	...	...	59·1	54·6
October	...	...	...	75·5	30·1	45·4	59·6	42·7	16·9	51·2	...	...	52·4	50·5
November	...	...	...	59·3	22·0	37·3	51·4	34·5	16·6	42·8	...	...	45·2	43·1
December	...	...	...	54·5	17·5	37·0	44·0	29·9	14·1	36·9	...	...	39·0	37·6
Yearly Sums, Means, and Totals ...	...	...	...	69·5	31·2	38·3	58·3	39·7	18·6	49·0	...	...	52·4	49·0

BELFAST. Lat. 54° 36′ N.

January	29·691	30·286	28·546	54·0	27·0	27·0	50·7	37·3	13·4	44·0	56·7	32·9	44·5	42·7
February	29·661	30·124	28·629	58·7	30·0	28·7	55·1	39·5	15·6	47·3	65·1	35·0	46·4	43·9
March	29·827	30·339	29·045	57·0	29·0	28·0	53·0	33·4	19·6	43·2	...	...	43·7	39·7
April	29·835	30·423	29·660	74·0	31·3	42·7	65·2	40·2	25·0	52·7	...	...	52·8	47·8
May	29·789	30·228	29·044	69·0	34·0	35·9	63·1	40·5	22·6	51·8	...	...	51·5	46·3
June	29·985	30·204	29·422	79·0	37·0	42·0	71·0	46·8	24·2	58·9	112·3	44·4	59·9	54·1
July	29·894	30·255	29·600	87·0	44·0	43·0	82·0	51·0	31·0	66·5	115·4	...	66·1	59·9
August	30·042	30·400	29·409	86·0	40·3	45·7	79·9	49·2	30·7	64·5	98·7	...	62·7	57·3
September	29·554	30·400	29·056	82·0	38·0	44·0	75·4	48·2	27·2	61·8	96·4	...	58·7	54·6
October	29·887	30·438	29·074	75·5	32·5	43·0	72·8	46·1	26·7	59·4	82·5	...	55·6	51·7
November	29·738	30·464	29·205	70·0	28·5	41·5	56·6	38·2	18·4	47·4	62·3	32·7	43·9	41·3
December	29·665	30·586	28·496	58·6	20·5	38·1	50·2	31·4	18·8	40·8	54·2	30·2	38·8	36·5
Yearly Sums, Means, and Totals ...	29·797	30·345	29·050	70·9	32·7	38·2	64·5	41·8	22·7	55·1	82·6	29·2	52·0	50·0

BUTTEVANT. Lat. 52° 14′ N.

January	...	...	...	59·0	25·0	34·0	56·1	34·0	22·1	45·0	...	...	43·8	42·4
February	...	...	...	65·0	29·0	36·0	59·2	37·1	22·1	48·1	...	...	45·2	43·7
March	...	...	...	65·0	20·0	45·0	58·0	31·4	26·6	44·7	...	...	46·7	44·6
April	...	...	...	78·0	29·0	49·0	65·1	39·3	25·8	52·2	...	...	52·2	50·5
May	...	...	...	74·0	28·0	46·0	65·9	39·8	25·2	52·4	...	...	53·8	51·4
June	...	...	...	90·0	30·0	60·0	75·0	44·2	30·8	59·6	...	...	64·1	62·9
July	...	...	...	89·0	38·0	51·0	79·2	49·7	29·5	64·4	...	...	68·3	66·4
August* ...	...	...	...	80·0	38·0	42·0	73·0	45·6	27·4	59·3	...	...	64·9	63·0
September† ...	...	...	...	88·0	36·0	52·0	69·3	44·7	24·6	57·0	...	...	59·0	54·6
October... ...	...	...	...	75·0	29·0	46·0	62·2	41·9	21·2	51·6	...	...	53·4	50·6
November	...	...	...	67·1	19·5	47·6	54·2	35·7	18·5	44·9	...	...	46·3	44·3
December	...	...	...	58·8	14·2	44·6	45·8	28·9	16·9	37·3	...	...	39·1	37·8
Yearly Sums, Means, and Totals ...	...	...	...	74·0	27·9	46·1	63·5	39·3	24·2	51·4	...	...	53·1	51·0

* For only 16 days, the Regiment having left Buttevant 16th August. † For 27 days.

No. XXXI—*continued.*

taken at Stations in Ireland in the year 1869.

Long. 8° 0′ W. Height above Sea 304 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	30 Feet above the Ground.
											lbs. per sq. foot.	Miles.				Inches.	Inches.
40·6	·253	2·9	0·4	87·0	...	2·00	3·50	15·50	10·00	0·00	...	...	8·0	3·9	22	3·59	...
42·6	·273	3·2	0·5	86·3	...	1·00	1·00	12·50	13·50	0·00	...	...	8·3	3·7	23	3·49	...
38·4	·232	2·7	0·6	82·0	...	13·50	7·00	3·50	7·00	0·00	...	...	5·9	3·5	15	2·41	...
45·5	·305	3·4	1·1	74·5	...	4·50	8·00	9·50	8·00	0·00	...	...	5·9	3·8	19	3·04	...
44·7	·296	3·4	1·2	74·7	...	9·00	17·00	0·50	4·50	0·00	...	...	7·2	5·7	15	2·94	...
51·2	·376	4·2	1·8	69·9	...	10·00	6·00	6·00	8·00	0·00	...	...	6·9	5·4	8	1·10	...
55·4	·438	4·8	2·4	67·2	...	2·50	3·50	11·50	13·50	0·00	...	...	8·0	5·2	14	1·85	...
54·4	·424	4·7	2·0	70·0	...	6·00	4·50	4·50	16·50	0·00	...	...	6·8	5·2	11	1·32	...
50·6	·369	4·2	1·5	73·5	...	1·00	4·00	12·50	12·50	0·00	...	...	7·7	5·7	22	4·90	...
48·6	·343	3·9	0·6	87·1	...	6·25	5·50	9·00	10·25	0·00	...	...	7·0	5·5	15	2·05	...
40·7	·253	2·9	0·5	84·5	...	6·00	0·50	8·75	14·75	0·00	...	...	6·5	4·1	24	3·18	...
35·8	·210	2·4	0·4	88·8	...	7·50	5·50	8·00	10·00	0·00	...	...	6·2	5·1	17	5·28	...
45·7	·314	3·5	1·1	78·7	...	69·25	66·00	101·75	128·00	0·00	...	...	7·0	4·7	205	35·16	...

Long. 5° 57′ W. Height above Sea 50 feet.

40·6	·253	2·9	0·5	86·6	545·3	4·50	6·50	11·50	8·50	0·00	...	88·5	8·5	0·5	17	3·33	3·03
41·0	·258	3·0	0·6	82·9	542·7	6·25	1·50	7·00	13·25	0·00	...	160·1	7·9	2·0	21	4·96	4·65
35·0	·203	2·4	0·9	71·7	548·9	8·50	13·00	5·75	3·75	0·00	...	132·6	6·8	2·5	18	2·85	2·30
42·8	·276	3·2	1·3	69·0	538·9	6·75	10·75	7·50	5·00	0·00	...	119·1	6·4	2·4	14	2·05	1·93
40·9	·257	2·9	1·4	67·3	539·6	8·00	19·50	2·25	1·25	0·00	...	136·5	7·5	2·7	18	2·22	2·11
49·0	·348	3·8	1·9	67·0	533·7	15·50	6·50	0·50	7·50	0·00	...	89·5	6·9	3·4	9	1·16	1·11
54·8	·430	4·8	2·3	67·2	525·3	8·75	6·50	4·25	11·50	0·00	...	106·7	6·5	1·9	16	2·17	2·04
52·7	·399	4·4	1·9	70·0	531·5	10·00	7·75	4·00	9·25	0.00	...	85·2	7·4	2·8	10	1·72	1·62
50·9	·373	4·2	1·3	75·5	527·1	5·50	4·50	6·75	13·25	0·00	...	137·8	8·4	1·8	21	5·17	4·95
48·0	·337	3·8	1·2	76·2	536·4	3·50	5·50	5·50	8·50	0·00	...	100·9	8·1	1·2	13	1·49	1·42
38·3	·231	2·7	0·6	80·1	546·9	10·00	0·00	3·50	16·50	0·00	...	107·0	6·1	0·6	26	5·25	4·91
33·4	·192	2·2	0·6	82·2	551·5	7·00	5·50	5·00	10·50	3·00	...	127·8	6·6	0·9	15	2·63	2·51
43·9	·296	3·3	1·2	74·6	538·9	94·25	87·50	63·50	108·75	3·00	...	115·9	7·2	1·8	198	34·50	32·50

Lon. 8° 40′ W. Height above Sea feet.

40·7	·255	2·9	0·3	88·8	...	3·00	6·50	18·00	3·50	0·00	...	...	6·9	6·4	25	5·94	...
41·9	·266	3·0	0·4	88·7	...	2·25	4·25	15·75	5·75	0·00	...	...	5·2	6·1	16	2·42	...
42·2	·270	3·1	0·6	85·3	...	15·00	5·00	10·25	0·75	0·00	...	...	5·9	6·0	14	2·42	...
43·8	·346	3·9	0·5	88·3	...	4·75	10·50	13·00	1·75	0·00	...	...	4·9	5·5	14	3·63	...
49·1	·347	3·9	0·7	84·0	...	14·00	12·75	3·75	0·50	0·00	...	...	4·8	3·5	19	5·77	...
51·9	·555	6·1	0·5	92·9	...	13·25	5·25	9·50	2·00	0·00	...	...	4·0	4·4	6	0·47	...
54·9	·616	6·7	0·8	88·6	...	2·75	6·25	16·00	6·00	0·00	...	...	4·5	5·0	10	1·53	...
51·5	·546	6·0	0·8	88·6	...	4·50	3·25	5·25	3·00	0·00	...	...	5·0	5·0	6	1·72	...
50·6	·370	4·2	1·4	74·0	...	0·00	4·00	15·50	7·50	0·00	...	...	5·2	6·8	21	4·42	...
47·8	·382	3·7	0·8	81·2	...	8·75	4·50	7·75	9·00	1·00	...	...	5·3	6·4	5	0·31	...
42·0	·268	3·1	0·5	86·0	...	10·75	4·25	4·25	7·25	3·50	...	...	6·7	6·3	15	2·72	...
36·1	·213	2·4	0·4	89·6	...	13·75	5·25	3·75	4·25	4·00	...	...	6·3	5·1	20	6·05	...
49·0	·365	4·1	0·6	86·3	...	92·75	71·75	122·75	51·25	8·50	...	...	5·2	5·5	171	33·37	...

Appendix

CORK. Lat. 51° 53′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean Of all the highest.	Mean Of all the lowest.	Mean Daily Range.	Mean Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Hygrometer. Dry Bulb.	Hygrometer. Wet Bulb.
January	29·468	29·968	28·772	54·0	24·0	30·0	51·7	29·9	21·8	40·8	60·9	23·7	45·8	43·8
February ...	29·530	30·025	28·827	56·0	29·6	27·0	52·8	33·0	19·8	42·9	70·2	27·3	47·7	45·5
March	29·683	30·068	28·972	54·0	27·0	27·0	52·4	30·8	21·6	41·6	76·0	25·0	44·3	41·8
April	29·713	30·056	29·062	73·0	30·0	43·0	59·9	35·9	24·0	47·9	88·5	26·5	53·7	50·7
May	29·592	29·899	29·759	67·0	34·0	33·0	60·7	39·9	20·8	50·3	108·0	32·2	54·5	51·1
June	29·996	30·233	29·799	81·0	38·0	43·0	69·4	43·7	25·7	56·5	114·5	37·1	62·0	56·8
July	29·784	30·030	29·485	82·0	45·0	37·0	73·2	51·6	21·6	62·4	115·0	45·1	67·6	62·6
August	29·861	30·177	29·435	84·0	44·0	40·0	72·1	49·3	22·8	60·7	109·9	42·0	66·0	60·2
September ...	29·430	30·135	28·946	70·0	40·0	30·0	64·6	45·9	18·7	55·3	92·1	39·6	59·7	54·9
October	29·746	30·069	29·233	71·0	36·0	35·0	60·3	43·5	16·8	51·9	84·0	37·3	54·2	50·1
November ...	29·522	30·160	29·261	59·0	32·0	27·0	55·5	36·9	18·6	46·2	69·7	30·5	50·5	46·4
December ...	29·561	30·073	28·955	54·0	21·0	33·0	49·7	29·5	20·2	39·6	59·7	23·0	43·2	39·1
Yearly Sums, Means, and Totals ...	29·652	30·140	29·125	67·1	33·3	33·8	60·2	39·2	21·0	49·7	87·4	32·6	54·1	50·2

CURRAGH CAMP. Lat. 52° 8′ N.

January	29·309	29·938	28·220	58·8	29·6	29·2	47·6	35·8	11·8	41·7	55·3	...	43·7	42·6
February ...	29·360	29·837	28·325	62·4	28·3	34·1	50·6	36·4	14·2	43·5	67·2	...	45·5	44·0
March	29·433	29·929	28·687	51·7	23·1	28·6	46·4	30·6	15·8	38·5	76·9	...	41·0	38·7
April	29·459	29·882	28·684	70·1	30·1	40·0	57·3	38·5	18·8	47·9	87·1	...	51·2	48·0
May	29·340	29·802	28·622	63·6	29·5	34·1	54·5	38·7	15·8	46·6	83·2	...	49·9	46·6
June	29·635	29·861	29·026	78·9	32·6	46·3	64·6	44·2	20·4	54·4	98·8	...	54·4	50·2
July	29·549	29·913	29·139	85·4	44·5	40·9	73·0	49·6	23·4	61·3	106·3	...	64·3	60·6
August	29·686	29·992	29·188	86·9	34·2	52·7	69·4	47·0	22·4	58·2	102·0	...	62·8	57·7
September	29·221	30·023	28·769	70·1	35·8	34·3	63·9	45·1	18·8	54·5	92·3	...	57·6	54·5
October	29·570	30·077	28·638	74·5	29·1	45·4	56·8	40·3	16·5	48·5	80·2	...	51·0	49·3
November ...	29·453	29·978	28·761	64·7	24·2	40·5	50·4	33·8	16·6	42·1	63·2	...	43·3	41·7
December	29·282	30·048	28·265	62·4	10·5	51·9	54·0	28·1	15·9	36·0	49·6	...	36·8	35·1
Yearly Sums, Means, and Totals ...	29·441	29·940	28·694	69·1	29·3	39·8	56·5	39·0	17·5	47·7	80·2	...	50·1	47·4

DUBLIN. Lat 55° 25′ N.

January	29·678	30·291	28·584	56·5	26·0	30·5	50·4	37·4	13·9	43·9	71·0	32·6	45·9	43·9
February	29·705	30·241	28·660	60·8	30·7	30·1	52·7	39·9	12·8	46·3	82·6	34·4	47·9	45·5
March	29·790	30·307	29·026	53·2	25·2	28·0	47·7	32·9	14·8	40·3	89·0	28·8	43·9	40·3
April	29·826	30·284	28·958	75·1	32·3	42·3	58·4	41·0	17·4	49·7	104·0	36·2	52·4	49·2
May	29·722	30·195	28·974	61·5	30·5	31·0	53·9	40·6	13·3	47·2	87·5*	35·7*	49·8	47·1
June	29·986	30·192	29·366	75·0	36·2	38·8	64·9	46·3	18·6	55·6	112·4	45·8	59·2	55·4
July	29·898	30·258	29·470	79·8	43·0	36·8	73·1	52·4	20·7	62·7	121·3	50·5	66·2	61·7
August	30·029	29·343	29·502	80·0	34·9	45·1	68·9	48·6	20·3	58·7	113·3	46·7	63·0	57·0
September ...	29·535	30·354	28·925	73·2	34·3	38·9	65·6	48·8	16·8	57·2	105·0	46·0	60·0	55·5
October	29·927	30·428	29·011	74·0	30·0	44·0	58·6	44·3	14·3	51·4	93·9	41·5	53·2	50·6
November	29·793	30·344	29·128	60·4	22·3	38·1	50·6	36·1	14·5	43·3	76·7	33·6	45·6	43·3
December	29·626	30·445	28·627	58·0	11·8	45·2	45·4	31·1	14·3	38·2	61·5	28·4	39·9	37·9
Yearly Sums, Means, and Totals ...	29·793	30·226	29·019	67·3	29·8	37·5	57·5	41·6	15·9	49·5	93·2	38·3	52·2	49·0

* 5 days short.

No. XXXI.—*continued.*

Long. 8° 20′ W. Height above Sea 257 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	Feet above the 25 Ground.
											lbs. per sq. foot.	Miles.				Inches.	Inches.
41·5	·263	3·0	0·6	85·8	539·7	4·25	5·75	12·25	8·75	0·00	...	123·8	8·0	4·5	24	7·95	7·02
43·1	·278	3·2	0·6	85·3	538·8	8·00	5·50	6·75	7·75	0·00	...	...	8·0	5·0	13	2·93	2·63
38·8	·237	2·7	0·6	80·8	545·5	13·50	7·50	2·25	7·75	0·00	...	...	7·0	4·5	11	2·22	2·08
47·8	·331	3·7	0·9	80·0	535·4	6·75	6·00	7·25	10·00	0·00	...	103·1	7·9	4·5	8	3·58	3·01
47·8	·331	3·8	1·0	77·6	532·4	7·50	9·50	8·50	5·50	0·00	...	90·0	8·2	4·8	17	6·38	5·75
52·3	·397	4·3	1·9	71·0	531·4	11·50	4·75	4·00	9·75	0·00	...	78·7	6·0	4·0	0	0·00	0·00
58·7	·494	5·4	2·1	73·0	521·5	4·00	4·50	12·25	10·25	0·00	...	118·9	7·0	4·0	14	3·09	2·74
55·5	·440	4·9	2·1	69·0	524·9	11·50	5·50	4·50	9·50	0·00	...	83·1	6·5	3·5	5	1·23	1·19
50·6	·370	4·1	1·6	72·0	523·9	6·00	3·00	11·00	10·00	0·00	...	109·3	8·0	4·0	20	5·75	5·05
46·1	·311	3·5	1·2	73·6	535·6	11·75	7·25	5·25	6·75	0·00	...	105·6	8·0	4·0	9	1·45	1·21
42·1	·268	3·1	1·1	74·0	535·8	12·75	3·75	3·50	10·00	0·00	...	106·1	7·8	4·5	11	2·19	1·96
34·2	·197	2·3	0·9	70·5	543·6	13·00	3·75	5·00	9·25	0·00	...	124·8	8·0	4·0	12	5·72	5·23
46·5	·326	3·7	1·2	76·0	534·0	110·50	66·75	82·50	105·25	0·00	...	104·3	7·4	4·3	144	42·49	37·79

Long. 4° 48′ W. Height above Sea 450 feet.

41·3	·260	3·0	0·3	91·2	538·9	2·50	2·50	18·50	7·50	0·00	...	439·8	8·6	4·3	16	5·65	4·29
42·2	·269	3·0	0·4	88·5	538·2	2·75	0·50	10·25	14·00	0·50	...	432·8	7·9	5·2	15	2·10	1·71
35·8	·209	2·4	0·6	81·9	544·7	11·50	7·75	5·25	5·00	1·50	...	292·2	6·9	4·4	7	1·91	1·55
44·7	·297	3·4	0·9	78·8	533·5	5·50	4·75	12·00	6·25	1·50	...	232·6	5·8	4·3	11	2·03	1·71
43·1	·279	3·2	0·6	77·8	533·6	11·00	10·25	5·25	4·50	0·00	...	244·1	7·9	4·1	13	3·10	2·61
46·1	·311	3·5	1·3	73·2	533·4	10·00	4·75	4·75	10·50	0·00	...	240·6	6·4	3·5	5	0·84	0·69
57·5	·475	5·2	1·4	76·5	520·7	4·50	1·00	12·50	18·00	0·00	...	297·8	5·5	3·5	10	1·83	1·46
53·4	·409	4·5	1·8	71·5	524·9	9·00	3·75	5·75	12·50	0·00	...	249·9	5·5	3·9	9	1·32	1·11
51·7	·384	4·3	1·0	81·0	522·3	3·75	2·75	12·25	11·25	0·00	...	382·5	7·2	4·8	18	†	3·41
47·1	·324	3·6	0·7	84·5	535·8	8·50	1·50	10·25	9·75	1·00	...	349·0	6·7	4·1	11	1·44	1·22
39·8	·246	2·8	0·4	87·5	542·4	6·50	0·50	8·75	14·25	0·00	...	274·6	6·6	4·4	14	2·33	1·96
32·7	·186	2·1	0·4	85·5	546·6	8·75	3·50	10·00	7·75	1.00	...	331·7	6·1	4 9	13	3·46	2·92
44·6	·304	3·4	0·8	81·6	534·5	84·25	43·50	115·50	116·25	5·50	...	314·0	6·7	4·3	142	25·41	24·65

Long. 6° 20′ W. Height above Sea 72 feet.

41·6	·265	3·0	0·6	85·9	543·5	4·00	0·50	21·50	5·00	0·00	...	112·80	7·3	2·5	19	3·94	...
42·8	·276	3·1	0·7	84·1	541·7	4·75	0·50	7·00	15·75	0·00	...	164·00	6·7	4·8	19	1·61	...
37·1	·221	2·6	0 6	79·8	549·1	14·25	2·50	3·25	11·00	0·00	...	100·30	6·7	3·3	19	2·33	...
45·9	·311	3·5	0·9	79·2	539·1	7·25	3·25	7·00	12·00	0·50	...	57·40	6·0	4·4	13	1·55	...
44·2	·291	3·3	0·7	81·9	539·9	9·50	10·50	6·25	4·75	0·00	...	41·60	7·4	3·9	20	4·85	...
52·6	·389	4·4	1·3	77·4	534·1	12·75	4·50	2·00	10·75	0.00	...	39·14	6·3	5·0	15	0·88	...
58·1	·484	5·4	1·7	75·7	524·9	6·50	3·25	7·25	13·50	0·50	...	51·89	5·2	4·4	10	0·67	...
52·5	·395	4·4	2·0	68·5	531·0	10·00	1·25	3·25	12·00	4·50	...	46·04	5·7	4·0	12	1·33	...
51·5	·382	4·2	1·5	73·5	525·3	5·00	0·50	8·00	16·50	0·00	...	114·54	6·6	5·0	21	2·91	...
48·0	·335	3·8	0·8	82·4	539·7	9·00	4·50	6·00	11·50	0·00	...	58·88‡	6·8	4·6	15	2·76	...
40·7	·254	2·9	0·6	83·5	546·1	9·00	0·25	4·50	16·25	0·00	...	129·26§	6·1	5·3	18	2·32	...
35·3	·207	2·4	0·5	84·0	549·5	7·75	3·75	7·75	11·75	0·00	...	137·96	7·1	4·6	18	2·88	...
45·8	·319	3·6	1·0	79·6	538·6	99·75	35·25	83·75	140·75	5·50	...	87·90	6·5	4·3	199	28·03	...

* 20 feet above the ground. † Instrument broken, registered 2·70 in 19 days. ‡ 18 days only. § 20 days only.

Appendix

FERMOY. Lat. 52° 2′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	...	...	...	56·0	30·2	25·8	51·5	37·7	13·8	44·6	...	...	45·4	43·7
February	...	...	...	58·0	28·0	30·0	53·6	37·3	16·3	45·4	...	...	47·9	46·2
March	...	...	...	56·2	28·7	27·5	52·1	32·9	19·2	42·5	...	...	49·7	41·7
April	...	...	...	75·0	29·5	45·5	62·6	39·2	23·4	50·9	...	..	52·8	50·1
May	...	...	...	68·8	30·0	38 8	61·5	45·9	15·6	53·7	...	...	55·3	52·1
June	...	...	...	82·0	34·0	48·0	70·0	45·6	24·4	57·8	...	...	63·0	58·3
July	...	...	...	84·0	34·0	50·0	75·3	51·1	24·2	63·2	...	...	67·2	64·7
August	...	...	...	87·2	37·0	50·2	73·3	46·8	26·5	60·1	...	...	65·8	62·4
September	...	...	...	73·6	30·0	43·6	67·8	45·1	22·7	56·4	...	...	61·1	58·9
October...	...	...	...	75·0	32·0	43·0	60·9	47·6	13·3	54·2	...	...	54·8	53·3
November	...	...	...	60·3	29·3	31·0	57·2	40·6	16·6	48·9	...	...	46·7	45·6
December	...	...	...	59·0	20·0	39·0	57·6	34·5	23·1	46·1	...	...	40·6	39·1
Yearly Sums, Means, and Totals ...	...	...	...	69·6	30·2	39·4	61·9	42·0	19·9	51·9	...	...	54·2	51·3

LIMERICK. Lat. 52° 40′ N.

January	...	...	...	55·0	22·5	32·5	50·5	35·0	15·5	42·7	...	...	46·4	44·6
February	...	...	...	58·2	29·1	29·1	53·4	37·5	15·9	45·4	...	...	48·4	46·2
March	...	...	...	56·0	23·0	33·0	51·2	31·4	19·8	41·3	...	...	45·7	42·0
April	...	...	...	74·0	28·0	46·0	60·6	38·8	21·8	49·7	...	...	54·7	51·0
May	...	...	...	67·0	28·5	38·5	59·6	38·8	20·8	49·2	...	...	53·8	49·5
June	...	...	...	85 0	32·5	52·5	70·3	44·9	25·4	57·6	...	...	62·7	56·1
July	...	...	...	86·0	42·0	44·0	76·2	50·1	26·1	63·1	...	...	67·6	60·9
August	...	...	...	90·5	35·0	55·5	72·9	46·6	26·3	59·7	...	...	66·1	59·2
September	...	...	...	78·0	37·0	41·0	66·3	45·4	20·9	55·8	...	...	59·7	55·4
October...	...	...	...	77·0	33·0	44·0	62·0	43·0	19·0	52·8	...	...	55·2	51·8
November	...	...	...	61·5	20·0	41·5	54·2	34·1	20·1	44·1	...	...	47·7	45·4
December	...	...	...	58·2	15·6	42·6	46·0	29·4	16·6	37·7	...	...	41·2	39·5
Yearly Sums, Means, and Totals ...	...	...	...	70·5	28·8	41·7	60·2	39·6	20·6	49·9	...	...	54·1	50·1

TEMPLEMORE. Lat. 52° 48′ N.

January*	...	...	...	53·0	24·0	29·0	48·7	34·9	13·8	41·8	55·0	...	45·2	44·3
February	...	...	...	...	...	...	...	...	...	...	...	...	...	...
March	...	...	...	57·0	20·0	37·0	52·6	32·4	20·2	42·5	88·1	...	43·7	41·4
April	...	...	...	75·0	30·0	45·0	62·9	38·7	24·2	50·8	98·8	...	52·7	49·8
May	...	...	...	72·0	33·0	39·0	63·2	38·8	24·4	51·0	92·1	...	51·0	47·6
June	...	...	...	80·0	35·0	45·0	67·4	45·2	22·2	56·3	112·9	...	60·8	55·8
July	...	...	...	94·0	42·0	42·0	76·1	51·4	24·7	63·7	120·2	...	67·6	60·4
August†	...	...	...	87·0	41·0	46·0	75·2	43·8	31·4	59·5	117·9	...	67·9	60·8
September	...	...	...	72·0	39·0	33·0	66·0	45·4	20·6	55·7	121·0	...	60·8	56·7
October...	...	...	...	74·0	23·0	51·0	58·7	40·7	18·0	49·7	85·0	...	53·1	50·3
November	...	...	...	58·0	26·0	32·0	53·3	36·9	16·4	45·1	65·7	...	45·3	42·8
December	...	...	...	57·0	25·0	32·0	43·9	29·6	14·3	36·7	53·9	...	38·8	36·8
Yearly Sums, Means, and Totals ...	...	...	...	69·9	30·7	38·2	60·9	39·3	21·1	50·8	91·9	...	53·3	49·6

* For 16½ days. † For 14 days, 17th to 30th inclusive.

No. XXXI—*continued.*

Long. 8° 18′ W. Height above Sea 176 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Amount of Rain fall	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
41·7	·265	3·0	0·5	87·5	...	1·75	3·50	19·75	6·00	0·00	...	...	6·9	5·6	29	6·76	...
44·3	·291	3·3	0·5	88·1	...	3·25	4·25	8·75	11·75	0·00	...	...	6·7	5·4	20	2·09	...
33·2	·190	2·3	1·9	53·0	...	12·50	7·25	2·25	9·00	0·00	...	...	4·3	5·5	19	2·87	...
47·4	·328	3·7	0·8	81·9	...	7·00	8·50	7·50	7·00	0·00	...	...	4·6	5·4	16	2·21	...
49·0	·349	3·9	1·0	80·1	...	4·25	6·25	11·00	9·50	0·00	...	...	8·0	5·7	20	4·66	...
54·3	·423	4·7	1·7	73·5	...	3·50	5·25	9·50	11·75	0·00	...	...	3·0	7·2	9	0·85	...
62·7	·571	6·2	1·1	85·5	...	0·50	6·50	16·75	7·25	0·00	...	...	2·8	7·6	13	1·32	...
59·6	·512	5·6	1·4	81·0	...	0·50	4·00	16·50	10·00	0·00	...	...	2·3	7·7	7	1·17	...
57·0	·466	5·1	0·9	86·9	...	2·25	8·00	14·75	5·00	0·00	...	...	4·6	7·7	22	6·09	...
51·3	·337	4·3	0·5	89·5	...	9·50	6·00	7·50	8·00	0·00	...	...	5·2	7·3	8	0·37	...
44·4	·293	3·3	0·3	92·3	...	7·00	2·50	5·50	15·00	0·00	...	...	5·8	5·5	21	2·23	...
37·2	·226	2·6	0·4	88·0	...	7·50	5·00	7·50	11·00	0·00	...	...	6·3	5·4	22	6·12	...
48·5	·358	4·0	0·9	82·3	...	59·50	67·00	127·25	111·25	0·00	...	...	5·0	6·3	206	36·78	...

Long. 8° 36′ W. Height above Sea 75 feet.

42·3	·273	3·1	0·5	87·4	...	2·50	7·75*	13·00	3·75	4·00	...	...	7·5	...	22	3·88	...
43·8	·286	3·2	0·6	84·6	...	1·75	0·75	6·50	17·00	2·00	...	...	8·1	...	23	3·33	...
37·7	·227	2·6	0·9	73·8	...	11·75	5·75	3·50	10·00	0·00	...	...	6·2	2·7	17	2·90	...
47·5	·326	3·7	1·1	75·8	...	6·00	8·50	10·75	4·75	0·00	...	...	6·4	4·6	21	3·41	...
45·3	·301	3·4	1·2	73·0	...	10·25	12·25	3·75	2·75	2·00	...	...	8·0	4·2	21	4·38	...
50·4	·367	4·1	2·3	64·7	...	7·75	2·75	5·50	11·00	3·00	...	...	7·3	4·5	7	1·01	...
55·6	·443	4·8	2·6	65·2	...	0·75	3·25	8·75	13·25	5·00	...	...	6·5	6·1	14	1·54	...
53·6	·411	4·5	2·5	64·4	...	6·50	3·50	2·25	11·25	7·50	...	...	6·0	3·8	13	1·98	...
51·6	·383	4·3	1·5	74·9	...	3·50	3·25	10·75	11·50	1·00	...	...	7·4	5·7	24	5·51	...
48·5	·343	3·8	1·1	78·8	...	*4·75	*3·50	*6·00	*12·75	*2·00	...	...	7·8	4·2	16	2·85	...
42·9	·276	3·2	0·6	84·6	...	11·25	3·25	4·75	10·75	0·00	...	...	7·0	4·5	25	3·95	...
37·4	·223	2·6	0·4	86·8	...	11·75	6·25	4·75	8·25	0·00	...	...	6·7	4·0	21	4·95	...
46·4	·321	3·6	1·3	76·1	...	78·50	60·75	80·25	117·00	26·50	...	...	7·1	3·7	224	39·19	...

Long. 7° 49′ W. Height above Sea 75 feet.

43·2	·280	3·2	0·3	93·0	...	3·00	5·25	2·75	1·00	4·50	...	...	8·2	5·0	14	2·80	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
38·7	·235	2·8	0·3	89·6	...	14·00	7·25	2·25	4·50	3·00	...	...	5·7	4·6	24	2·24	...
49·9	·322	3·7	0·9	81·2	...	3·50	4·50	3·75	9·75	8·50	...	...	4·4	5·2	19	2·74	...
44·1	·290	3·3	0·9	77·6	...	13·00	11·00	3·00	1·00	3·00	...	...	4·1	5·3	19	4·49	...
50·5	·368	4·1	1·8	68·5	...	14·50	1·50	1·00	5·00	8·00	...	...	2·7	7·1	9	1·12	...
54·7	·429	4·7	2·7	63·2	...	0·00	0·00	7·75	7·25	16·00	...	...	3·6	8·0	12	1·95	...
55·2	·437	4·8	2·7	63·6	...	...	...	...	...	...	...	...	4·0	0·0	1	0·12	...
53·2	·405	4·3	1·4	76·2	...	3·25	0·75	11·25	14·75	0·00	...	...	4·0	4·0	21	6·97	...
47·5	·328	3·7	0·8	81·2	...	4·50	3·75	14·25	8·50	0·00	...	...	5·3	5·3	11	0·71	...
39·9	·247	2·8	0·6	81·8	...	5·00	3·75	7·75	13·50	0·00	...	...	5·0	5·0	14	2·90	...
34·1	·197	2·3	0·5	84·6	...	13·25	3·50	8·75	5·50	0·00	...	...	4·9	5·1	14	4·99	...
46·4	·322	3·6	1·2	78·2	...	74·00	41·25	62·50	70·75	43·00	...	...	4·7	4·9	158	31·03	...

* For 29 days only.

Appendix

Abstract of Results of Meteorological Observations

Stations, with their Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
Athlone ... 304 ft.	...	...	...	91·5	17·5	74·0	58·3	39·7	18·6	49·0	...	...	52·9	49·0
Belfast* ... 50 ,,	29·797	30·345	29·050	87·0	20·5	66·5	64·5	41·8	22·7	55·1	82·6	...	52·0	50·0
Buttevant†	...	...	...	90·0	14·2	75·8	63·5	39·3	24·2	51·4	...	...	53·1	51·9
Cork ... 257 ft.	29·652	30·140	29·125	84·0	21·0	63·0	60·2	39·2	21·0	49·7	87·4	32·6	54·1	50·2
Curragh Campt 450 ,,	29·441	29·940	28·694	86·9	10·5	76·4	56·5	39·0	17·5	47·7	80·2	...	50·1	47·4
Dublin§ ... 72 ,,	29·793	30·228	29·019	80·0	11·8	68·2	57·5	41·6	15·9	49·5	93·2	38·3	52·2	49·0
Fermoy ... 176 ,,	...	...	...	87·2	20·0	67·2	61·9	42·0	19·9	51·9	...	...	54·2	51·3
Limerick‖ ... 75 ,,	...	...	...	90·5	15·6	74·9	60·2	39·6	20·6	49·9	...	...	54·1	50·1
Templemore¶ ...	...	...	...	87·0	20·0	67·0	60·9	39·8	21·1	50·8	91·9	...	53·3	49·6

* Belfast: Maximum in sun's rays not recorded during March, April, and May.
† Buttevant: Observations extend over only 347 days.
‡ Curragh: Amount of rain not registered for 11 days in September.
§ Dublin: Maximum in sun and minimum on grass, 5 days short. Movement of wind, 23 days short.
‖ Limerick: Direction of wind, 2 days short in October.
¶ The observations at *Templemore* extend over only 333·5 days, and the direction of wind at that station is recorded only for 319·5 days.

No. XXXI—*continued.*

taken at Stations in Ireland in the Year 1869.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.													
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rain fall on the Ground.	Latitude.	Longitude.
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.						
											lbs. per sq. foot	Miles				Inches	° ′	° ′
45·7	·314	3·5	1·1	78·7	...	69·25	66·00	101·75	128·00	0·00	...	...	7·0	4·7	205	35·16	53 26 N.	8 0 W.
43·9	·296	3·3	1·2	74·6	538·9	94·25	87·50	63·50	108·75	3·00	...	115·9	7·2	1·8	198	34·50	54 36 ,,	5 7 ,,
49·0	·365	4·1	0·6	86·3	...	92·75	71·75	122·75	51·25	8·50	...	...	5·2	5·5	171	33·37	52 14 ,,	8 40 ,,
46·5	·326	3·7	1·2	76·0	534·0	110·50	66·75	82·50	105·25	0·00	...	104·3	7·4	4·3	144	42·49	51 53 ,,	8 20 ,,
44·6	·304	3·4	0·8	81·6	534·5	84·25	43·50	115·50	116·25	5·50	...	314·0	6·7	4·3	142	25·41	52 8 ,,	4 48 ,,
45·8	·319	3·6	1·0	79·6	538·6	99·75	35·25	83·75	140·75	5·50	...	87·9	6·5	4·3	199	28·03	55 25 ,,	6 20 ,,
48·5	·358	4·0	0·9	82·3	...	59·50	67·00	127·25	111·25	0·00	...	...	5·0	6·3	206	36·78	52 2 ,,	8 18 ,,
46·4	·321	3·6	1·3	76·1	...	78·50	60·75	80·25	117·00	26·50	...	...	7·1	3·7	224	39·19	52 40 ,,	6 36 ,,
46·4	·322	3·6	1·2	78·2	...	74·00	41·25	62·50	70·75	43·00	...	...	4·7	4·9	158	31·03	52 48 ,,	7 49 ,,

APPENDIX

Abstract of Result of Meteorological Observations

GRAHAM'S TOWN, CAPE OF GOOD HOPE. Lat. 33° 18′ S.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean.						Hygrometer.	
	Mean reduced and corrected to 32°.	Height reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January	28·177	28·841	27·875	105·6	35·9	69·7	92·0	58·2	33·8	75·1	141·2	50·5	72·5	64·8
February	28·134	28·362	27·987	114·0	34·0	80·0	92·0	59·4	32·6	75·7	135·6	43·4	75·0	67·0
March	28·202	28·476	27·965	97·6	45·0	52·6	87·0	55·6	31·4	71·2	128·4	40·4	67·3	62·2
April	28·387	28·484	27·925	97·3	40·0	57·3	84·7	49·9	34·8	67·3	123·1	38·3	65·1	58·7
May	28·139	28·646	27·788	90·0	36·0	54·0	82·8	46·2	36·6	64·3	113·7	34·6	63·9	54·2
June	28·229	28·583	27·714	82·9	36·0	46·9	80·8	45·9	34·9	63·3	108·4	34·8	61·8	53·8
July	28·301	28·410	27·885	84·5	32·0	52·5	80·7	41·2	39·5	60·9	109·4	27·3	60·7	49·6
August	28·208	28·650	27·900	93·0	35·0	58·0	87·2	43·8	43·4	65·5	116·1	31·4	61·8	51·5
September	28·181	28·642	27·843	97·7	38·0	59·7	87·5	48·3	39·2	67·9	119·5	37·3	62·2	53·9
October... ...	28·133	28·531	27·835	91·2	45·5	45·7	88·4	50·9	37·5	69·6	116·5	44·2	64·1	58·6
November	28·088	28·391	27·890	96·2	41·5	54·7	88·6	52·5	36·1	70·5	122·0	45·3	63·3	61·0
December	28·022	28·282	27·697	98·0	44·7	53·3	81·7	52·8	28·9	67·2	124·0	44·5	69·2	62·0
Yearly Sums, Means, and Totals ...	28·192	28·539	27·859	95·6	38·6	57·0	86·1	50·4	35·7	68·2	121·5	39·3	65·6	58·1

FORT NAPIER, NATAL. Lat. 29° 36′ S.

January	27·595	27·799	27·265	99·0	57·0	42·0	86·2	63·9	22·3	75·0	138·0	...	79·1	71·2
February	27·635	27·809	27·287	102·0	56·0	46·0	87·7	60·7	27·0	74·2	...	...	75·5	70·1
March	27·658	27·828	27·452	94·0	45·0	49·0	80·6	57·2	23·4	68·9	134·1	...	74·9	66·7
April	27·745	28·111	27·383	96·0	46·0	50·0	79·7	55·1	24·6	67·4	127·4	...	71·8	64·8
May	27·699	28·156	27·307	90·0	32·0	58·0	77·3	46·7	30·6	62·0	122·1	...	68·0	59·7
June	27·715	28·034	27·260	88·0	37·0	51·0	77·9	40·3	37·6	59·1	123·5	...	68·6	57·4
July	27·717	28·085	27·217	88·0	62·0	26·0	78·3	39·4	38·9	58·8	124·1	...	68·1	58·9
August	27·735	28·121	27·363	98·0	55·0	43·0	81·2	40·9	40·3	61·0	...	...	66·9	56·7
September	27·745	28·141	27·302	95·0	38·0	57·0	84·7	47·8	46·9	66·3	...	...	75·8	58·7
October... ...	27·640	28·056	27·413	97·0	46·0	51·0	83·8	53·1	30·7	68·5	...	...	75·3	60·4
November	...	...	...	...	...	...	...	...	...	...	...	...	...	...
December	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Yearly Sums, Means, and Totals ...	27·688	28·014	27·325	94·7	47·4	47·3	81·7	50·5	31·2	66·1	128·2	...	72·4	62·5

BATHURST, GAMBIA. Lat. ° ′

January	...	...	...	97·0	56·0	41·0	88·1	61·9	26·2	75·0	...	...	76·4	71·8
February	...	...	...	104·0	57·0	47·0	96·3	62·6	33·9	79·4	...	...	80·4	79·6
March	...	...	...	101·0	60·0	41·0	89·1	64·3	24·8	76·7	...	...	76·7	66·1
April	...	...	...	110·0	60·0	50·0	91·6	65·4	26·2	78·5	...	...	79·4	68·7
May	...	...	...	101·0	64·0	37·0	92·0	68·0	24·0	80·0	...	...	82·0	71·5
June	...	...	...	105·0	67·0	38·0	97·1	72·5*	24·6*	84·8*	...	...	86·4	77·8
July	...	...	...	100·0	...	...	92·0	...	...	...	...	...	83·1	77·4
August	...	...	...	94·0	...	...	88·7	...	...	...	...	...	81·5	76·9
September	...	...	...	97·0	...	...	92·2	...	...	...	...	...	83·0	76·4
October... ...	...	...	...	...	...	...	...	...	...	...	...	...	88·0	81·1
November	...	...	...	...	...	...	...	...	...	...	94·9	...	84·1	76·8
December	...	...	...	...	...	...	85·9	...	...	...	96·1	...	83·8	75·4
Yearly Sums, Means, and Totals ...	...	...	...	101·0	60·6	42·3	101·3	65·8	26·6	79·1	95·5	...	82·1	74·1

* June. For 26 days only, the Minimum Thermometer having been broken on the night of 26th.

No. XXXII.

taken at Stations in Cape of Good Hope, Gambia, and China, in the year 1869.

Long. 26° 28′ E. Height above Sea 1,700 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	24 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
59·0	·502	5·4	3·2	62·2	488·8	1·25	9·50	15·0	5·25	0·00	...	279·15	4·6	4·1	7	1·31	0·69
61·2	·542	5·8	3·6	62·0	485·6	1·25	7·25	14·0	5·00	0·00	...	293·99	5·3	4·4	7	2·87	1·68
58·1	·485	5·3	2·0	72·5	494·2	2·75	9·50	11·25	7·50	0·00	...	262·37	5·5	4·4	9	2·62	1·39
53·5	·409	4·5	2·3	66·1	499·8	3·00	5·25	12·25	9·50	0·00	...	198·82	4·6	4·2	5	0·48	0·18
46·1	·311	3·4	3·1	53·1	497·0	2·50	2·75	4·75	21·00	0·00	...	231·91	3·9	4·5	6	0·57	0·43
46·9	·322	3·6	2·6	58·0	500·7	5·00	2·00	3·25	19·75	0·00	...	287·30	4·5	4·5	5	0·50	0·34
39·9	·245	2·7	3·2	46·3	503·6	5·00	0·00	2·00	24·00	0·00	...	298·80	2·4	4·8	3	0·43	0·21
42·6	·273	3·0	3·1	49·6	502·5	3·50	2·50	9·75	15·25	0·00	...	264·10	4·1	4·8	10	1·40	0·95
46·8	·319	3·6	2·7	57·0	499·7	2·75	5·75	12·25	9·25	0·00	...	284·66	3·6	4·4	6	2·42	1·04
54·0	·419	4·7	2·0	69·6	496·4	1·25	7·50	13·50	8·25	0·50	...	273·20	5·4	4·5	9	6·75	4·42
59·1	·501	5·5	0·9	86·5	495·8	2·00	5·75	14·75	7·50	0·00	...	283·10	6·0	4·1	14	3·87	2·68
56·4	·455	5·0	2·9	63·2	489·6	1·25	4·50	16·25	9·00	0·00	...	270·20	4·6	4·1	12	1·01	0·26
51·9	·399	4·4	2·6	62·2	496·1	32·00	62·25	129·00	141·25	0·50	...	268·54	4·5	4·4	93	24·23	14·27

Long. 30° 2′ E. Height above Sea 2,157 feet.

65·8	·634	6·8	3·8	63·5	470·9	4·75	19·25	6·50	0·50	0·00	...	...	5·0	4·8	11	5·31	...
66·2	·645	6·9	2·1	72·5	475·8	4·25	17·00	6·25	0·50	0·00	...	...	3·8	5·0	5	1·37	...
60·8	·533	5·8	3·6	61·2	477·5	3·00	18·00	9·00	1·00	0·00	...	...	5·6	4·8	19	6·93	...
59·5	·511	5·6	2·9	65·0	481·8	0·50	16·25	12·75	0·50	0·00	...	...	5·2	4·6	15	5·95	...
53·2	·405	4·4	3·1	58·8	485·2	6·25	18·50	5·75	0·50	0·00	...	...	3·1	4·4	4	1·85	...
48·6	·343	3·8	3·9	48·4	485·4	7·25	20·25	2·50	0·00	0·00	...	...	0·8	4·3	1	1·24	...
51·6	·384	4·2	3·4	55·2	485·6	7·75	21·00	0·25	2·00	0·00	...	...	1·2	4·2	2	9·92	...
48·5	·343	3·7	3·5	52·1	487·3	10·75	12·50	4·00	3·75	0·00	...	...	1·2	4·4	5	4·00	...
46·5	·317	3·5	6·1	35·8	479·5	10·25	14·25	2·00	3·50	0·00	...	...	1·1	4·6	3	2·21	...
49·7	·356	3·8	5·6	40·6	478·0	7·50	16·50	5·50	1·50	0·00	...	...	3·9	4·6	16	5·35	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
55·0	·447	4·8	3·8	55·3	480·7	62·25	173·50	54·50	13·75	0·00	...	...	3·1	4·5	114	44·1	...

Long. ° ′ . Height above Sea 6 feet.

68·6	·699	7·5	2·2	76·6	...	...	...	...	...	...	...	...	...	...	...	...	...
62·3	·560	5·0	5·1	53·6	...	...	...	...	...	...	...	...	...	...	...	...	...
58·6	·494	5·4	4·5	53·3	...	...	...	...	...	...	...	...	...	...	...	...	...
61·3	·543	5·8	4·9	53·9	...	...	...	...	...	...	...	...	...	...	...	...	...
64·4	·606	6·5	5·2	55·5	...	...	...	...	...	...	...	...	...	...	...	...	...
72·2	·793	8·3	5·0	62·2	...	...	...	...	...	...	...	...	...	...	...	...	...
73·6	·827	8·8	3·3	73·2	...	...	...	...	...	...	...	...	...	...	...	...	...
73·8	·835	8·9	2·5	77·6	...	...	...	...	...	...	...	...	...	...	...	...	...
72·0	·784	8·4	3·6	69·6	...	...	...	...	...	...	...	...	...	...	...	...	...
76·7	·918	9·7	4·3	69·4	...	...	...	...	...	...	...	...	...	...	...	...	...
72·0	·784	8·4	4·1	66·9	...	...	...	...	...	...	...	...	...	...	...	...	...
69·8	·730	7·8	4·6	63·2	...	...	...	...	...	...	...	...	...	...	...	...	...
68·8	·714	7·6	4·1	64·6	...	...	...	...	...	...	...	...	...	...	...	...	...

HONG KONG. Lat. 22° 16′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean. Of all the highest.	Mean. Of all the lowest.	Mean. Daily Range.	Mean. Approximate Temperature.	Maximum in Sun's rays.	Minimum on grass.	Hygrometer. Dry Bulb.	Hygrometer. Wet Bulb.
January	30·122	30·375	30·001	75·0	40·0	35·0	67·6	55·2	12·4	61·4	97·8	51·1	62·3	55·5
February	30·132	30·238	30·018	74·0	48·0	26·0	68·3	55·9	12·4	62·1	98·3	53·4	62·6	57·6
March	29·949	30·168	29·714	79·0	54·0	25·0	71·3	58·7	12·6	65·0	97·0	66·5	66·0	61·7
April	30·006	30·021	29·981	87·0	57·0	30·0	77·6	64·4	13·2	71·0	104·2	62·0	71·9	67·7
May	29·812	29·963	29·585	92·0	65·0	27·0	86·3	73·4	12·9	79·8	127·0	70·7	81·2	75·7
June	29·698	29·798	29·002	97·0	74·0	23·0	91·3	78·1	13·2	84·7	128·8	75·3	85·4	81·2
July	29·717	29·817	29·648	98·0	77·0	21·0	95·2	79·7	15·5	87·4	140·5	75·0	88·0	81·4
August	29·717	29·779	29·647	97·0	75·0	22·0	93·6	78·1	15·5	85·8	139·0	73·0	86·9	80·1
September	29·783	30·011	29·686	95·0	67·0	28·0	90·7	76·6	14·1	83·6	135·4	71·7	84·8	78·6
October	29·916	30·036	29·789	92·0	62·0	30·0	85·2	70·2	15·0	77·7	123·0	64·5	78·5	71·9
November	30·065	30·190	29·926	84·0	52·0	32·0	75·4	58·2	17·2	66·8	108·9	51·4	68·4	59·9
December	30·111	30·228	30·009	77·0	50·0	27·0	70·7	57·1	13·6	63·9	88·7	49·9	64·5	58·5
Yearly Sums, Means, and Totals ...	29·917	30·052	29·734	87·2	60·1	27·1	81·1	67·1	14·0	74·1	111·5	63·7	75·0	69·1

Abstract of Results of Meteorological Observations

Stations, with their Height above the Sea.		Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
		Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Mean. Of all the highest.	Mean. Of all the lowest.	Mean. Daily Range.	Mean. Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Hygrometer. Dry Bulb.	Hygrometer. Wet Bulb.
	feet														
Graham's Tn., Cape of Good Hope	1,700	28·192	28·539	27·859	114·0	32·0	82·0	86·1	50·4	35·7	68·2	121·5	39·3	65·6	58·1
Fort Napier, Natal ...	2,157	27·688	28·014	27·325	102·0	32·0	70·0	81·7	50·5	31·2	66·1	128·2	...	72·4	62·5
Bathurst, Gambia ...	6	..	...	...	...	...	...	...	...	...	...	...	...	82·1	74·1
Hong Kong, China ...	43	29·917	30·052	29·734	97·0	40·0	57·0	81·1	67·1	14·0	74·1	111·5	63·7	75·0	69·1

No. XXXII—continued.

Long. 114° 19′ E. Height above Sea 43 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	23 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
49·7	·356	4·0	2·3	63·3	533·7	7·00	20·50	0·00	2·00	1·50	...	...	4·5	4·0	1	0·21	0·20
53·4	·409	4·5	1·8	72·0	533·2	5·75	19·25	1·25	0·75	1·00	...	...	5·6	4·3	13	4·32	4·21
58·6	·486	5·4	1·6	76·5	525·9	7·25	16·50	2·50	2·75	2·00	...	...	7·7	4·2	14	5·50	5·40
64·5	·608	6·6	1·9	77·0	520·3	3·75	18·50	1·50	3·25	3·00	...	...	5·9	...	16	5·46	5·34
72·0	·785	8·4	3·0	74·0	507·1	3·75	15·75	5·25	4·25	2·00	...	...	3·7	...	10	13·00	12·77
78·5	·976	10·3	2·6	79·4	500·0	2·00	13·00	8·50	5·00	1·50	...	...	4·6	...	16	11·50	11·15
77·2	·933	9·8	4·2	70·6	493·4	0·00	14·50	11·25	2·75	2·50	...	...	3·9	...	19	6·81	6·60
75·8	·895	9·4	4·1	69·6	499·8	4·00	9·25	4·50	9·75	3·50	...	...	2·9	...	13	10·50	10·26
74·5	·858	9·0	3·7	71·2	502·9	1·75	19·75	3·00	0·00	5·50	...	...	3·8	...	19	15·10	14·67
67·3	·670	7·2	3·3	69·1	512·1	7·00	21·25	0·50	0·25	2·00	...	...	3·0	3·0	5	5·38	5·26
53·2	·406	4·4	3·2	58·0	526·2	13·25	14·25	0·00	0·00	2·50	...	...	1·7	2·8	0	0·00	0·00
53·5	·411	4·5	2·1	67·5	531·0	8·50	16·25	0·50	2·75	3·00	...	...	3·5	3·3	3	0·16	0·15
64·8	·649	6·9	2·8	70·7	515·9	64·00	198·75	38·75	33·50	30·00	...	...	4·2	3·6	129	77·94	76·01

taken at Stations in Cape of Good Hope, Gambia, and China in the Year 1869.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.												
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rain fall on the Ground.	Latitude.	Longitude.
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.						
											lbs. per sq. foot	Miles				Inches	° ′	° ′
51·9	·399	4·4	2·6	62·2	496·1	32·00	62·25	129·00	141·25	0·50	...	268·54	4·5	4·4	93	24·23	33 18 S.	26 28 E.
55·0	·447	4·8	3·8	55·3	480·7	62·25	173·50	54·50	13·75	0·00	...	...	3·1	4·5	114	44·1	29 36 ,,	30 2 ,,
68·8	·714	7·6	4·1	64·6	...	...	...	...	...	...	...	...	...	...	...	...	...	...
64·8	·649	6·9	2·8	70·7	515·9	64·00	198·75	38·75	33·50	30·00	...	...	4·2	3·6	129	77·94	22 16 N.	114 19 ,,

Appendix

Abstract of the Results of Meteorological Observations

QUEBEC. Lat. 46° 48′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January	29·653	30·401	29·050	41·4	−17·0	58·4	23·8	9·2	14·6	16·5	*	*	16·5	14·8
February	29·631	30·261	28·850	36·0	− 5·2	41·2	26·1	9·9	16·2	18·0	*	*	18·5	17·0
March	29·730	30·204	29·276	52·0	−11·0	63·0	35·4	10·2	25·2	22·8	*	*	22·8	20·8
April	29·545	29·962	29·004	61·2	18·0	43·2	46·5	29·3	17·2	37·9	81·2	28·8	39·2	35·8
May	29·530	29·884	28·961	81·2	27·0	54·2	59·5	40·7	18·8	50·1	94·1	39·1	52·7	46·9
June	29·643	30·068	29·219	86·2	39·0	47·2	73·1	52·3	20·8	62·7	112·8	50·3	65·0	57·9
July	29·569	29·978	28·999	88·2	47·1	41·1	77·6	58·3	19·3	67·9	114·8	55·9	69·8	63·2
August	29·687	30·053	29·339	80·2	46·0	34·2	71·5	53·8	17·7	62·6	104·9	51·9	64·8	58·2
September ...	29·831	30·096	29·301	82·0	34·3	47·7	70·1	53·5	16·6	61·8	100·7	51·6	63·4	58·7
October	29·626	30·018	29·092	72·2	19·5	52·7	50·5	38·1	12·4	44·3	69·2	37·2	45·2	41·8
November	29·603	30·204	28·602	53·0	7·8	45·2	34·4	23·8	10·6	29·1	44·5	23·8	29·3	27·4
December	29·831	30·353	28·856	36·6	− 5·0	41·6	25·7	12·8	12·9	19·2	*	*	20·0	18·2
Yearly Sums, Means, and Totals ...	29·656	30·125	29·046	64·2	16·7	47·5	49·5	32·6	16·9	41·0	...	...	42·3	38·4

HALIFAX, NOVA SCOTIA. Lat. 44° 39′ N.

January	29·804	30·290	29·206	55·9	− 7·0	62·9	32·2	14·8	17·4	23·5	60·8		25·6	23·7
February	29·675	30·394	28·791	49·5	7·0	42·5	36·3	18·0	18·3	27·1	71·0		28·5	26·9
March	29·779	30·324	29·151	54·0	− 5·5	59·5	39·5	15·9	23·6	27·7	85·8		30·6	29·6
April	29·589	30·040	29·219	61·6	22·4	39·2	50·0	29·4	20·6	39·7	90·7		42·5	39·8
May	29·588	29·902	29·068	71·6	23·0	48·6	59·7	35·7	24·0	47·7	97·5		49·9	46·0
June	29·780	30·028	29·446	80·0	37·0	43·0	71·9	45·9	26·0	58·9	110·5	47·6	61·1	55·6
July	29·728	30·000	29·236	83·7	45·0	38·7	76·0	51·3	24·7	63·6	116·7	54·2	67·2	61·7
August	29·762	30·216	28·976	81·5	39·8	41·7	73·4	48·5	24·9	60·9	112·3	52·4	65·7	59·3
September ...	29·984	30·273	29·504	82·6	32·9	49·7	70·0	47·2	22·8	58·6	111·6	49·6	62·3	57·5
October	29·761	30·185	29·055	77·1	21·6	55·5	59·7	37·7	22·0	48·7	96·7	41·2	52·2	48·5
November	29·742	30·094	29·063	58·5	16·4	42·1	45·2	26·9	18·3	36·0	71·6	30·1	38·5	36·7
December	29·947	30·456	29·164	55·6	10·1	45·5	40·8	22·3	18·5	31·5	62·4	...	33·3	32·3
Yearly Sums, Means, and Totals ...	29·762	30·192	29·156	67·6	20·2	47·4	54·5	32·8	21·7	43·6	90·6	...	46·4	43·1

Broken.

ST. JOHN'S, NEWFOUNDLAND. Lat. 47° 52′ N.

January	29·493	30·153	28·256	59·2	−10·0	69·2	45·0	11·2	33·8	28·1	67·6	10·9	23·4	22·7
February	29·585	30·490	28·894	51·6	−12·3	63·9	38·8	13·2	25·6	26·0	61·5	13·0	25·8	24·9
March	29·739	30·317	29·130	47·2	− 1·8	49·0	44·0	18·2	25·8	31·1	78·0	17·9	31·9	31·0
April	29·481	29·962	28·553	60·3	17·4	42·9	51·2	24·2	27·0	37·7	96·5	23·7	37·0	35·4
May	29·524	29·961	28·838	75·3	25·0	50·3	59·9	30·5	29·4	45·2	106·9	30·0	45·6	42·8
June	29·784	30·098	29·370	79·0	24·9	54·1	69·4	37·6	31·8	53·5	114·8	36·6	54·6	50·2
July	29·723	30·031	28·884	85·2	30·4	54·8	71·6	43·5	28·1	57·5	113·1	41·5	59·2	55·2
August	29·809	30·132	28·969	86·0	38·0	48·0	72·4	51·6	20·8	62·0	108·6	44·0	65·3	61·3
September ...	29·986	30·471	28·518	75·0	26·5	48·5	66·2	44·0	22·2	55·1	97·3	41·2	58·5	52·1
October	29·840	30·284	28·951	81·2	38·0	43·2	71·0	46·8	24·2	58·9	95·5	32·3	46·7	43·7
November	29·727	30·148	28·886	62·1	13·0	49·1	54·6	28·4	26·2	41·5	75·2	24·3	38·5	37·4
December	29·625	30·247	28·876	65·0	5·4	59·6	43·7	22·3	21·4	32·0	75·9	17·3	32·5	31·3
Yearly Sums, Means, and Totals ...	29·697	30·191	28·844	68·9	16·2	52·7	57·3	30·9	26·4	44·1	90·9	27·7	43·2	40·7

* Suspended during the extremely cold weather.

No. XXXII—*continued.*

taken at Stations in North America and the West Indies, in the year 1869.

Long. 71° 12′ W. Height above Sea 230 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of days on which rain fell.	On the Ground.	10 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
1·8	·048	0·6	0·5	51·5	578·2	7·00	7·00	4·00	13·00	0·00	...	155·0	7·2	1·1	...	...	...
5·9	·057	0·7	0·5	57·5	575·2	5·50	8·25	3·50	10·75	0·00	...	169·0	7·2	1·0	...	...	...
8·2	·063	0·7	0·7	51·6	572·0	5·00	7·50	4·00	14·50	0·00	...	144·4	...	...	2	0·47	0·46
31·3	·176	2·0	0·8	74·2	548·8	5·00	9·25	4·25	11·50	0·00	...	127·7	7·2	1·0	11	1·99	1·95
41·1	·258	2·9	1·6	65·7	533·8	2·75	14·50	5·25	6·50	2·00	...	126·7	6·7	1·1	13	2·74	2·72
52·1	·388	4·3	2·5	62·6	522·3	4·75	7·75	5·75	11·75	0·00	...	120·9	6·3	1·2	17	7·27	7·22
58·1	·489	5·3	2·7	65·8	515·5	5·25	3·25	7·50	15·00	0·00	...	119·6	6·6	2·3	18	5·06	5·01
52·7	·399	4·4	2·4	64·8	523·2	5·25	3·50	5·00	17·25	0·00	...	126·8	7·1	2·1	15	2·93	2·90
54·7	·430	4·8	1·7	73·9	527·0	5·50	6·75	6·25	8·50	3·00	...	115·4	7·0	1·3	15	3·95	3·93
37·9	·228	2·6	0·8	75·8	543·5	4·25	6·25	6·75	12·75	1·00	...	127·8	7·3	1·4	12	6·33	6·25
20·9	·112	1·3	0·6	69·7	561·6	2·25	5·75	5·25	11·75	5·00	...	143·2	8·1	2·4	3	0·27	0·27
5·4	·055	0·7	0·6	51·0	577·4	3·50	5·00	5·00	15·00	2·50	...	159·9	7·1	2·9	...	...	...
30·8	·225	2·5	1·3	63·7	548·2	56·00	84·75	62·50	148·25	13·50	...	136·5	6·5	1·5	106	31·01	30·71

Long. 63° 36′ W. Height above Sea 125 feet.

13·8	·081	1·0	0·7	59·0	569·9	15·25	4·25	2·50	9·00	0·00	...	234·1	7·3	2·7	10	3·47	§
20·3	·112	1·3	0·5	71·7	563·8	11·00	3·75	4·75	8·50	0·00	...	281·7	7·0	*	11	4·72	†
26·8	·145	1·7	0·4	84·6	563·0	15·00	3·75	5·25	7·00	0·00	...	267·2	6·1	3·4	10	7·62	†
36·5	·216	2·5	0·6	80·1	545·8	11·25	6·00	7·75	5·00	0·00	...	258·7	6·6	3·2	8	2·56	1·65
41·9	·266	3·0	1·1	73·6	537·5	9·25	5·25	10·00	6·50	0·00	...	244·9	6·2	2·7	11	5·48	4·65
50·9	·372	4·2	1·8	69·6	528·8	6·25	3·75	10·25	9·75	0·00	...	266·8	6·0	4·9	12	3·55	2·60
57·3	·471	5·2	2·2	70·5	521·1	8·50	1·75	9·75	11·00	0·00	...	315·4	5·4	4·7	8	3·92	3·50
54·1	·419	4·6	2·3	66·7	523·5	10·50	3·25	6·50	10·75	0·00	...	308·1	5·2	5·3	7	2·72	2·37
53·4	·409	4·5	1·7	73·0	530·8	9·50	2·75	5·00	12·75	0·00	...	338·4	5·2	4·2	8	1·74	1·40
44·7	·296	3·4	1·1	76·0	538·2	8·00	3·50	11·25	8·25	0·00	...	317·2	6·4	2·3	13	7·08	6·50
34·3	·198	2·3	0·5	85·6	553·2	11·50	5·00	4·75	8·75	0·00	...	359·9	8·3	3·1	11	5·61	4·82
30·2	·170	1·9	0·3	89·6	563·1	9·75	5·25	8·50	7·50	0·00	...	418·1	7·2	3·8	8	6·51	4·55
38·7	·263	3·0	1·1	7·50	544·9	125·75	48·25	86·25	104·75	0·00	...	300·9	6·4	3·6	117	54·98	32·05

Long. 52° 42′ W. Height above Sea 130 feet.

18·5	·101	1·2	0·3	81·4	566·4	4·50	3·00	1·75	19·25	2·50	...	281·2	8·6	5·4	2	1·47	‡ 1·00
20·3	·109	1·3	0·4	78·6	565·2	7·00	1·50	5·50	11·00	3·00	...	368·4	8·8	5·9	3	2·06	1·58
28·9	·159	1·9	0·2	88·3	560·7	4·50	2·50	6·75	15·75	1·50	...	298·1	8·0	6·1	6	4·72	3·74
33·2	·189	2·2	0·4	86·2	556·1	10·25	6·00	5·75	8·00	0·00	...	302·5	8·0	6·6	6	5·62	4·33
39·6	·244	2·8	0·7	80·0	551·1	6·50	8·25	5·00	10·75	0·50	...	269·1	7·5	5·7	13	6·06	4·95
45·9	·309	3·5	1·3	72·2	535·9	4·00	4·75	8·00	11·25	2·00	...	215·1	6·1	4·6	9	5·35	3·28
51·6	·383	4·3	1·3	76·2	529·7	4·50	1·25	8·50	15·75	1·00	...	252·0	6·0	4·0	9	3·46	2·86
58·0	·484	5·3	1·5	78·0	524·2	6·25	5·00	11·00	8·75	0·00	...	202·6	5·9	4·8	10	6·68	5·20
46·4	·315	3·6	1·9	64·5	535·4	4·00	3·25	7·75	15·00	0·00	...	240·4	5·1	...	9	7·37	5·60
40·3	·251	2·9	0·7	79·7	545·7	6·25	5·50	10·50	7·75	1·00	...	142·8	7·8	...	8	3·59	2·41
35·9	·211	2·5	0·3	91·0	552·8	9·00	0·75	10·75	9·00	0·50	...	238·3	8·1	5·4	13	8·32	5·24
28·8	·159	1·8	0·3	86·0	558·8	6·00	1·50	7·25	14·75	1·50	...	318·1	9·0	5·3	9	3·34	2·31
37·5	·243	2·8	0·8	80·2	547·1	72·75	43·25	88·50	147·00	13·50	...	260·7	7·4	4·5	97	58·04	42·00

* No Paper. † Frozen, not reliable, ‡ 20 feet above the ground. § 40 feet above ground.

Appendix

BARBADOES.

Lat. 13° 4′ N.

Month	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	30·020	30·082	29·979	87·4	68·5	18·9	86·2	71·0	15·2	78·6	138·5	64·0	81·4	72·7
February	30·045	30·115	29·994	88·0	68·0	20·0	86·3	70·1	16·2	78·2	144·5	63·7	81·4	72·6
March	30·037	30·098	29·949	90·1	66·8	23·3	87·4	69·4	18·0	78·4	149·0	63·6	82·0	71·3
April	30·187	30·230	30·120	90·0	70·6	19·4	88·4	73·4	15·0	80·9	148·0	70·0	84·2	75·1
May	30·023	30·115	29·944	90·8	71·0	19·8	88·1	73·5	14·6	80·8	146·0	68·5	84·4	76·5
June	30·036	30·144	29·948	90·5	71·0	19·5	88·6	74·4	14·2	81·5	140·0	68·8	84·7	76·9
July	30·027	30·130	29·918	92·0	71·0	21·0	89·8	74·4	15·4	82·1	141·8	69·7	85·3	76·9
August	29·985	30·09*	29·908	92·0	71·6	20·4	89·2	73·6	15·6	81·4	142·1	68·3	85·1	77·9
September	29·938	30·081	29·905	93·5	70·6	22·9	89·7	73·4	16·3	81·6	148·8	69·4	85·6	78·1
October...	29·952	30·049	29·886	90·5	68·8	21·7	88·6	73·6	15·0	81·1	146·0	68·1	84·9	77·7
November	29·956	30·082	29·832	89·1	71·0	18·1	87·3	73·4	13·9	80·3	144·0	66·4	83·8	76·5
December	*	*	*	87·3	63·1	24·2	85·2	69·2	16·0	77·2	134·6	63·2	80·6	73·8
Yearly Sums, Means, and Totals	30·019	30·102	29·944	90·1	69·3	20·8	87·9	72·5	15·4	80·2	143·6	66·9	83·6	75·5

NEWCASTLE, JAMAICA.

Lat. 18° 6′ N.

January	26·290	26·359	26·147	81·0	57·0	24·0	76·6	59·2	17·4	67·9	116·2	55·3	68·3	64·3
February	26·319	26·382	26·267	82·0	51·0	31·0	76·6	57·8	18·8	67·2	112·4	54·7	67·7	63·8
March	26·328	26·358	26·266	83·0	53·0	30·0	78·5	60·5	18·0	69·5	117·9	54·6	66·9	62·5
April	26·361	26·358	26·238	90·0	59·0	31·0	81·4	61·4	20·0	71·4	117·0	57·9	70·2	65·0
May	26·304	26·342	26·251	86·0	59·0	27·0	83·0	61·4	21·6	72·2	119·3	61·4	73·4	66·9
June	26·329	26·379	29·289	90·0	60·0	30·0	84·7	62·5	22·2	73·6	123·7	61·2	74·1	68·2
July	26·336	26·394	26·286	89·0	60·0	29·0	85·2	61·2	24·0	73·2	127·2	...	74·8	68·1
August	26·302	26·399	26·214	91·0	58·0	33·0	84·7	61·2	23·5	73·0	123·0	...	72·6	67·8
September	26·247	26·299	26·117	90·0	60·0	30·0	82·2	61·2	21·0	71·7	124·6	...	72·6	68·3
October...	26·231	26·297	26·164	85·0	59·0	26·0	80·0	61·4	18·6	70·7	124·6	...	74·0	68·3
November	26·236	26·344	26·164	82·0	44·0	38·0	75·9	58·2	17·7	67·0	120·9	...	69·4	65·8
December	26·243	26·344	26·149	85·0	50·0	35·0	73·9	55·2	18·7	64·5	118·6	...	66·8	62·7
Yearly Sums, Means, and Totals ...	26·288	26·354	26·212	86·2	55·8	30·4	80·2	60·1	20·1	70·1	120·4	...	70·9	65·9

UP PARK CAMP, JAMAICA.

Lat. 17° 59′ N.

January	29·770	29·855	29·633	107·0	61·0	46·0	96·9	64·9	32·0	80·9	...	59·5	83·8	73·9
February	29·425	29·871	29·690	103·0	63·0	40·0	96·9	65·5	31·4	81·2	...	61·3	84·0	77·8
March	29·803	29·948	29·686	103·0	61·0	42·0	98·0	65·0	33·0	81·5	...	60·4	84·6	73·5
April	29·726	29·835	29·625	102·0	65·0	37·0	96·9	67·1	29·8	82·0	...	63·3	86·3	75·7
May	29·660	29·825	29·482	103·0	62·0	41·0	97·0	65·8	31·2	81·4	...	65·0	86·4	76·7
June	29·692	29·839	29·529	105·0	62·0	43·0	100·6	67·1	33·5	83·8	...	65·4	87·3	77·3
July	29·772	29·833	29·688	105·0	68·0	37·0	101·7	70·1	31·6	85·9	...	65·3	89·4	77·2
August...	29·750	29·843	29·661	103·5	65·0	38·5	99·1	69·1	30·0	84·1	...	65·7	85·7	76·4
September	29·695	29·778	29·616	104·0	66·0	38·0	99·3	68·1	31·2	83·7	...	66·0	85·6	77·1
October...	29·692	29·813	29·589	105·5	64·5	41·0	99·9	67·5	32·4	83·7	...	66·2	84·8	77·3
November	29·715	29·788	29·636	103·0	63·0	40·0	98·4	65·4	33·0	81·9	...	64·2	84·1	75·4
December	29·750	29·858	29·653	102·0	59·0	43·0	98·0	63·0	35·0	80·6	140·0	60·5	83·8	72·8
Yearly Sums, Means, and Totals ...	29·704	29·840	29·624	103·8	63·3	40·5	98·5	66·5	32·0	82·5	...	63·5	85·5	75·9

* Barometer sent to England.

No. XXXII—*continued.*

Long. 59° 40′ W. Height above Sea 25 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	32 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
66·8	·658	7·0	4·4	61·6	511·2	14·00	16·50	0·50	0·00	0·00	...	225·1	4·9	4·6	17	1·08	0·86
66·7	·654	7·0	4·4	61·2	511·6	9·00	15·50	3·50	0·00	0·00	...	204·2	4·5	4·2	11	1·68	1·34
64·1	·599	6·4	5·3	54·9	511·2	12·25	16·75	2·00	0·00	0·00	...	190·8	4·4	4·4	8	0·53	0·24
69·1	·712	7·5	4·9	59·8	511·1	8·00	18·50	3·50	0·00	0·00	...	185·4	5·1	4·0	11	8·40	5·36
71·3	·767	8·1	4·4	64·8	507·8	7·25	17·75	6·00	0·00	0·00	...	170·6	5·1	4·3	15	1·98	1·66
71·8	·781	8·3	4·4	65·5	507·7	13·25	15·75	1·00	0·00	0·00	...	213·0	5·8	4·7	20	3·37	3·10
71·4	·772	8·2	4·7	61·9	506·9	12·50	18·00	0·50	0·00	0·00	...	189·9	5·2	3·9	19	4·12	3·83
73·2	·820	8·6	4·2	67·3	506·1	10·00	19·00	2·00	0·00	0·00	...	217·2	5·3	4·2	17	8·08	6·67
73·2	·820	8·6	4·4	66·6	404·9	7·50	15·25	7·25	0·00	0·00	...	113·3	5·0	4·0	15	6·48	*
73·0	·814	8·6	4·2	67·2	506·0	9·50	17·75	3·75	0·00	0·00	...	127·9	4·6	3·8	19	6·30	*
71·7	·776	8·2	4·1	66·8	507·2	12·25	15·75	2·00	0·00	0·00	...	174·8	4·5	3·8	22	3·19	*
69·2	·714	7·6	3·6	67·8	...	17·75	13·25	0·00	0·00	6·00	...	149·0	4·8	3·7	20	4·96	*
70·1	·740	7·8	4·4	62·1	499·2	133·25	199·75	32·00	0·00	0·00	...	174·2	4·9	4·1	194	50·17	23·06

Long. 76° 42′ W. Height above Sea 3,800 feet.

																	†
61·1	·540	5·8	1·7	78·0	459·5	15·50	15·50	0·00	0·00	0·00	...	...	5·5	6·1	10	3·37	3·10
60·7	·532	5·8	1·7	78·5	460·5	14·00	5·00	0·00	9·00	0·00	...	...	4·8	6·1	9	9·22	8·90
59·0	·500	5·5	1·8	76·0	462·7	15·50	15·50	0·00	0·00	0·00	...	...	4·9	5·8	9	2·05	1·75
60·9	·538	5·9	2·2	72·2	458·1	9·50	15·00	5·50	0·00	0·00	...	...	4·9	6·1	12	9·15	8·38
62·1	·559	6·1	2·8	68·0	455·3	0·00	15·50	15·50	0·00	0·00	...	...	5·0	5·7	10	9·86	8·99
63·9	·594	6·5	2·7	70·4	454·9	0·00	15·00	15·00	0·00	0·00	...	...	5·2	6·0	7	2·80	2·56
63·2	·580	6·3	3·1	67·2	454·6	15·50	15·50	0·00	0·00	0·00	...	...	4·9	5·9	7	5·20	4·50
64·2	·602	6·5	2·2	75·6	457·5	15·50	15·50	0·00	0·00	0·00	...	...	5·4	5·8	21	14·50	11·70
65·1	·620	6·7	2·0	78·1	454·6	15·00	15·00	0·00	0·00	0·00	...	...	5·1	4·8	17*	9·70	6·49
64·1	·599	6·5	2·6	71·2	453·4	10·75	9·00	2·75	8·00	0·50	...	...	4·4	4·2	19	16·10	10·17
63·0	·574	6·3	1·5	80·0	457·4	9·00	8·50	6·50	6·00	0·00	...	...	4·7	4·8	20	19·30	11·62
59·4	·508	5·5	1·7	77·5	460·2	8·75	8·75	4·75	8·75	0·00	...	...	3·8	3·9	18	7·60	4·40
62·2	·562	6·1	2·2	74·4	448·5	129·00	153·75	50·00	31·75	0·50	...	....	4·9	5·4	159	108·85	82·59

Long. 76° 56′ W. Height above Sea 225 feet.

67·4	·667	7·1	5·2	57·3	504·8	3·50	15·50	11·75	0·25	0·00	...	86·3	4·0	4·4	8	2·11	1·71
73·7	·831	8·8	3·6	71·2	497·7	1·50	14·00	12·50	0·00	0·00	...	86·1	6·1	4·9	4	2·87	1·68
66·2	·646	6·8	5·8	53·7	504·7	3·75	14·00	11·50	1·75	0·00	...	101·0	5·3	4·5	3	0·17	0·23
68·8	·705	7·4	5·9	56·2	501·4	2·00	16·00	12·00	0·00	0·00	...	112·3	4·1	4·6	4	1·03	0·50
70·4	·745	7·9	5·5	58·9	500·0	3·00	16·75	11·00	0·25	0·00	...	109·3	4·8	5·0	4	6·65	3·59
70·9	·757	7·9	5·8	58·0	499·7	1·50	20·00	8·50	0·00	0·00	...	88·2	4·5	4·7	1	3·25	2·50
69·5	·719	7·6	7·0	51·8	499·3	3·00	21·00	6·50	0·50	0·00	...	89·4	4·3	5·2	1	0·20	0·25
70·4	·743	7·9	5·2	60·1	502·2	10·50	18·00	1·50	1·00	0·00	...	69·7	4·3	5·1	13	8·13	6·14
71·6	·775	8·2	4·8	62·6	501·1	7·75	19·00	3·00	0·25	0·00	...	43·6	3·3	4·5	5	3·69	3·33
72·4	·797	8·5	4·3	66·0	501·7	4·00	20·50	5·25	1·25	0·00	...	38·9	3·2	5·2	9	5·45	3·93
69·7	·725	7·7	4·7	61·3	503·1	10·50	17·00	1·50	1·00	0·00	...	41·3	3·0	5·4	5	2·83	2·44
65·5	·629	6·7	5·7	54·0	504·7	12·75	14·00	3·00	1·25	0·00	...	48·2	2·7	4·9	0	...	...
69·7	·728	7·7	5·3	59·2	501·7	63·75	205·75	88·00	7·50	0·00	...	76·2	4·1	4·9	57	36·38	26·30

* Out of order. † 35 feet above the ground.

Appendix

NASSAU, BAHAMAS. Lat. 25° 5′ N.

Month.	Readings of the Barometer.			Temperature of the Air.*							Mean Daily Readings of			
							Mean.						Hygrometer	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's Rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January	..	...	...	88·0	59·0	29·0	82·3	64·1	18·2	73·2	124·3	59·3	75·6	71·1
February	...	...	...	90·0	58·0	32·0	82·1	62·3	19·8	72·2	131·5	56·5	74·7	69·0
March	...	...	...	88·0	52·0	36·0	82·7	61·1	21·6	71·9	139·7	57·7	76·2	69·7
April	...	...	...	93·0	57·0	36·0	85·3	62·9	22·4	74·1	...	61·9	78·3	73·5
May	...	...	...	93·0	61·0	32·0	87·6	66·9	20·7	77·2	...	64·8	81·1	72·3
June	...	...	...	97·0	63·0	34·0	92·8	71·4	21·4	82·1	...	68·3	85·6	78·6
July	...	...	...	110·0*	67·0*	43·0*	96·7*	71·3*	25·4*	84·0*	...	69·3	88·2	80·1
August	...	...	...	104·0	66·0	38·0	95·6	71·0	24·6	83·3	...	70·8	86·9	80·1
September	...	...	...	104·0	64·0	40·0	92·4	70·2	22·2	81·3	...	73·8	85·3	79·1
October... ...	...	...	...	93·0	50·0	43·0	86·2	67·4	18·7	76·8	...	...	...	...
November	...	...	...	89·0	56·0	33·0	83·3	62·0	21·3	72·6	...	...	...	...
December	...	...	...	86·0†	55·0†	31·0†	78·8†	58·5†	20·3†	68·7†	...	...	...	...
Yearly Sums, Means, and Totals ...	...	...	...	94·6	59·0	35·6	87·1	65·7	21·4	76·4	...	...	81·3	74·8

BERMUDA. Lat. 32° 22′ N.

January	30·037	30·319	29·794	73·5	48·0	25·5	69·1	56·7	12·4	62·9	108·3	51·2	65·4	61·4
February	30·039	30·335	29·587	76·8	44·0	32·8	68·5	53·5	15·0	61·0	120·1	47·2	64·6	59·1
March	30·063	30·365	29·565	76·0	40·8	35·2	69·0	52·6	16·4	60·8	127·3	45·1	65·3	59·5
April	29·981	30·305	29·577	76·0	44·0	32·0	70·7	55·3	15·4	63·0	129·2	48·0	67·2	61·3
May	29·958	30·259	29·665	83·5	54·0	29·5	76·8	60·8	16·0	68·8	134·3	49·8	73·5	65·9
June	30·162	30·349	30·012	92·0	60·0	32·0	84·6	67·2	17·4	75·9	143·7	50·7	80·7	73·0
July	30·101	30·223	29·922	91·8	65·5	26·3	87·8	72·0	15·8	79·9	146·7	54·2	83·6	77·2
August	30·040	30·252	29·865	93·0	67·5	25·5	89·1	71·7	17·4	80·4	148·9	51·5	85·2	77·5
September	30·076	30·283	29·827	87·8	59·0	28·8	84·3	67·9	16·4	76·1	141·1	46·2	80·8	73·4
October... ...	29·950	30·157	29·676	85·5	52·8	32·7	80·1	64·7	15·4	72·4	131·6	56·2‡	76·4	70·0
November	29·992	30·265	29·633	79·0	50·0	29·0	72·8	57·7	15·1	65·2	120·8	52·0	68·6	61·9
December	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Yearly Sums, Means, and Totals ...	30·036	30·283	29·738	83·1	53·2	29·9	77·5	61·8	15·7	69·6	132·0	50·2	73·8	67·3

HONDURAS. Lat. 11° 29′ N.

January	...	...	...	90·0	63·0	27·0	86·4	71·6	14·8	79·0	...	...	79·3	75·2
February	...	...	...	91·0	65·0	26·0	87·7	73·5	14·2	80·6	...	...	80·9	76·3
March	...	...	...	90·0	62·0	28·0	86·7	74·5	12·2	80·6	...	...	82·1	78·8
April	...	...	...	93·0	63·0	30·0	91·3	75·9	15·4	83·6	...	...	85·6	81·9
May	...	...	...	92·0	73·0	19·0	88·0	79·1	8·9	83·5	...	...	83·8	80·8
June	...	...	...	...	76·0	...	...	79·5	...	...	...	...	82·7	81·6
July	...	...	...	...	76·0	...	...	81·2	...	...	...	...	82·5	81·8
August	...	...	...	...	74·0	...	...	78·2	...	...	...	...	82·8	82·2
September	...	...	...	...	73·0	...	...	78·6	...	...	...	...	85·8	84·7
October... ...	...	...	...	...	62·0	...	...	73·1	...	...	...	...	81·7	78·6
November	...	...	...	...	64·0	...	...	69·5	...	...	...	...	79·9	75·9
December	...	...	...	...	58·0	...	...	66·8	...	...	...	...	76·4	71·1
Yearly Sums, Means, and Totals ...	...	...	...	...	67·4	...	...	75·1	...	...	...	...	81·9	79·0

* For 26 days only, as Maximum Thermometer was out of order. † For 23 days.
‡ Instrument out of order. Mean of 9 days.

No. XXXII—*continued.*

Long. 77° 21′ W. Height above Sea 44 feet.

Hygrometrical Results from Glashier's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	20 Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
67·8	·683	7·3	2·2	77·1	...	12·50	14·25	2·50	1·75	0·00	...	...	5·8	...	16	3·50	...
64·8	·614	6·7	2·6	71·2	...	10·00	11·50	4·00	2·50	0·00	...	..	5·4	...	13	1·04	...
65·1	·619	6·7	3·1	69·0	...	9·00	12·50	5·50	4·00	0·00	...	...	4·6	...	3	2·77	...
70·1	·739	7·9	2·4	75·8	...	10·00	12·50	4·25	3·25	0·00	...	...	5·1	...	10	2·54	...
66·3	·647	6·9	4·4	60·9	...	5·50	13·25	7·75	3·50	1·00	...	...	5·8	...	13	4·42	...
74·1	·843	8·9	4·2	68·6	...	3·00	23·00	1·50	0·50	2·00	...	...	4·9	...	15	9·40	...
74·9	·867	9·1	4·9	65·2	...	0·75	25·00	3·25	0·00	2·00	...	...	4·4	...	22	4·97	...
75·7	·891	9·4	4·2	68·8	...	1·25	20·00	8·50	0·75	0·50	...	...	5·0	...	20	7·95	...
75·1	·872	9·2	3·7	71·2	...	4·00	22·50	3·50	0·00	0·00	...	...	5·3	...	16	7·91	...
...	...	...	...	...	...	*10·50	*10·50	*4·50	*3·50	*0·00	...	...	6·0	...	11	4·51	...
...	...	...	...	...	...	10·00	14·50	1·50	4·00	0·00	...	...	4·0	...	4	1·55	...
...	...	...	...	...	...	*10·00	*12·50	*2·50	*2·00	*0·00	...	...	1·2	...	2	0·15	...
70·4	·753	8·0	3·5	69·7	...	86·50	192·00	49·25	25·75	5·50	...	...	4·8	...	145	50·71	...

Long. 64° 40′ W. Height above Sea 61 feet.

																	†
58·1	·485	5·3	1·5	78·0	528·1	7·00	4·00	10·00	10·00	0·00	...	262·4	7·7	3·3	16	8·29	5·83
54·5	·426	4·7	2·0	70·1	529·3	6·50	1·50	8·50	10·50	1·00	...	294·9	7·4	3·0	15	5·97	3·97
54·8	·429	4·7	2·1	69·3	529·1	5·50	5·00	9·00	11·50	0·00	...	247·0	6·4	3·0	13	4·85	3·55
57·0	·466	5·1	2·2	69·5	525·6	5·50	1·00	9·00	13·50	1·00	...	245·0	6·7	3·5	13	4·99	3·76
60·3	·525	5·7	3·2	64·1	518·6	3·50	2·50	11·00	13·00	1·00	...	246·8	5·5	3·2	7	3·86	2·57
67·8	·679	7·3	3·9	64·2	514·2	4·00	4·50	15·00	6·50	0·00	...	148·4	4·6	2·8	7	0·97	0·53
73·0	·810	8·6	3·7	70·4	508·6	2·50	4·50	12·50	11·50	0·00	...	169·1	5·6	2·7	13	3·80	2·32
72·5	·800	8·5	4·4	65·4	507·2	5·00	4·00	10·50	9·50	2·00	...	151·7	4·5	3·2	7	2·50	1·49
68·4	·695	7·4	3·8	65·4	512·5	7·50	14·50	6·00	2·00	0·00	...	144·4	5·6	3·4	13	6·22	5·06
65·5	·628	6·8	3·1	69·4	515·0	6·00	9·50	9·00	6·50	0·00	...	160·9	8·1	3·4	8	7·05	5·97
56·7	·460	5·1	2·6	65·2	524·5	11·00	2·50	6·00	9·50	1·00	...	110·1	6·7	3·5	11	5·88	4·79
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
62·6	·582	6·3	2·9	68·3	519·3	64·00	53·50	106·50	104·00	6·00	...	198·2	6·2	3·2	123	54·38	40·34

Long. 88° 55′ W. Height above Sea feet.

72·4	·797	8·5	2·2	79·8	...	8·50	18·50	1·00	0·00	0·00	...	...	3·2	2·2	11	5·93	...
73·2	·818	8·8	2·5	77·9	...	7·50	13·50	1·00	0·00	0·00	...	...	2·4	2·2	7	2·71	...
76·6	·914	9·8	2·0	83·6	...	5·50	15·50	10·00	0·00	0·00	..	...	2·5	2·0	3	1·90	...
79·5	1·000	10·7	2·3	82·1	...	4·00	23·50	2·50	0·00	0·00	...	...	2·5	4·0	1	0·01	...
78·9	·984	10·5	1·8	85·0	...	7·50	22·50	1·00	0·00	0·00	...	...	2·7	3·3	6	5·80	...
80·8	1·051	11·2	0·7	94·5	...	3·00	26·50	0·50	0·00	0·00	...	...	2·6	3·3	*8	3·40	...
81·3	1·067	11·4	0·4	96·5	...	6·00	25·00	0·00	0·00	0·00	...	...	3·2	3·0	3	1·05	...
81·7	1·084	11·6	0·3	97·0	...	14·50	15·50	1·00	0·00	0·00	...	...	5·4	3·6	7	7·20	...
84·0	1·168	12·3	0·8	94·5	...	11·50	16·50	0·00	2·00	0·00	...	...	4·7	3·5	5	4·18	...
76·5	0·913	9·7	1·9	85·2	...	12·50	7·00	1·00	10·50	0·00	...	...	5·0	3·2	18	23·25	...
73·1	·818	8·8	2·2	80·9	...	12·00	6·00	0·00	11·00	1·00	...	...	5·1	2·9	11	5·92	...
67·3	·670	7·2	2·6	73·8	...	14·50	3·75	0·25	12·50	0·00	...	...	5·2	2·8	18	14·19	..
77·1	·940	10·0	1·6	85·9	...	107·00	183·75	27·25	36·00	1·00	...	...	3·7	3·0	98	77·54	...

* For 27 days.

† 20 feet above the ground.

Appendix

Abstract of Results of Meteorological Observations

Stations, with their Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
Quebec ... ... 230 ft.	29·656	30·125	29·046	88·2	−17·0	105·2	49·5	32·6	16·9	41·0	...	...	42·3	38·4
Halifax, N.S. ... 125 ,,	29·762	30·192	29·156	83·7	− 5·0	88·7	54·5	32·8	21·7	43·6	90·6	...	46·4	43·1
St. John's, Newfoundland... 130 ,,	29·697	30·191	28·844	86·0	−12·3	98·3	57·3	30·9	26·4	44·1	90·7	27·7	43·2	40·7
Barbados ... ... 25 ,,	30·019	30·102	29·944	93·5	63·1	30·4	87·9	72·5	15·4	80·2	143·6	66·9	83·6	75·5
Newcastle, Jamaica 3,800 ,,	26·288	26·354	26·212	91·0	50·0	41·0	80·2	60·1	20·1	70·1	120·4	...	70·9	65·9
Up Park Camp, Jamaica ... 225 ,,	29·704	29·840	29·624	107·0	59·0	48·0	98·5	66·5	32·0	82·5	...	63·5	85·5	75·9
Nassau, Bahamas* 44 ,,	...	...	...	110·0	50·0	60·0	87·1	65·7	21·4	76·4	...	...	81·3	74·8
Bermuda†	30·036	30·283	29·738	93·0	40·8	52·2	77·5	61·8	15·7	69·6	132·0	50·2	73·8	67·3
Honduras	...	...	...	...	58	...	...	...	...	...	...	...	81·9	79·0

* At Nassau the Hygrometrical observations extend over only nine months, and the observations of the direction the wind over only 359 days.

† Bermuda. There were no observations taken during December.

The observations with minimum thermometers extend over only eight months at Quebec; six months at Halifax; six months at Newcastle; nine months at Bahamas. They are therefore omitted.

No. XXXII—*continued.*

taken at Stations in North America and the West Indies in the Year 1869.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.												
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.							
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rain fall on the Ground.	Latitude.	Longitude.
											lbs. per sq. foot	Miles				Inches	° ′	° ′
30·8	·225	2·5	1·3	63·7	548·2	56·00	84·75	62·50	148·25	13·50	...	136·5	6·5	1·5	106	31·01	46 48 N.	71 12 W.
38·7	·263	3·0	1·1	75·0	544·9	125·75	48·25	86·25	104·75	0·00	...	306·9	6·4	3·6	117	54·98	44 39 ,,	63 36 ,,
37·3	·243	2·8	0·8	80·2	547·1	72·75	43·25	88·50	147·00	13·50	...	260·7	7·4	4·5	97	58·04	47 52 ,,	52 42 ,,
70·1	·740	7·8	4·4	62·1	499·2	133·25	199·75	32·00	0·00	0·00	...	174·2	4·9	4·1	194	50·17	18 4 ,,	59 40 ,,
62·2	·562	6·1	2·2	74·4	448·5	129·00	153·75	50·00	31·75	0·50	...	...	4·9	5·4	159	108·85	18 6 ,,	76 42 ,,
69·7	·728	7·7	5·3	59·2	501·7	63·75	295·75	88·00	7·50	0·00	...	76·2	4·1	4·9	57	36·38	17 59 ,,	76 56 ,,
70·4	·753	8·0	3·5	69·7	...	86·50	192·00	49·25	25·75	5·50	...	...	4·8	...	145	50·70	25 5 ,,	77 21 ,,
62·6	·582	6·3	2·9	68·3	519·3	64·00	53·50	106·50	104·00	6·00	...	198·2	6·2	3·2	123	54·38	32 22 ,,	64 40 ,,
77·1	·940	10·0	1·6	85·9	...	107·00	183·75	27·25	36·00	1·00	.	...	3·7	3·0	98	77·54	11 29 ,,	88 55 ,,

Appendix

Abstract of Results of Meteorological Observations

Colombo, Ceylon. Lat. 6° 56′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January	29·832	29·954	29·769	99·4	70·0	29·4	95·5	72·7	22·8	84·1	141·0	66·5	85·0	74·3
February	29·834	29·920	29·763	99·0	71·0	28·0	95·1	73·1	22·0	84·1	142·5	70·8	83·6	74·0
March	29·870	29·940	29·763	99·8	70·0	29·8	98·5	72·3	26·2	85·4	142·7	68·0	85·1	75·1
April	29·841	30·008	29·694	97·0	70·5	26·5	93·9	74·1	19·8	84·0	141·7	73·0	87·2	80·0
May	29·828	29·891	29·768	97·0	72·0	25·0	94·6	73·3	21·3	83·9	143·4	70·4	84·5	74·0
June	29·829	29·915	29·771	99·5	73·0	26·5	96·6	73·4	23·2	85·0	143·8	70·9	84·1	78·6
July	29·835	30·463	29·763	99·5	70·2	29·3	96·7	73·6	23·1	85·2	146·6	70·7	84·7	77·2
August	29·829	29·968	29·771	99·4	70·2	29·2	97·0	72·9	24·1	84·9	143·3	70·6	86·7	74·6
September	29·889	29·890	29·766	99·5	71·0	28·5	96·7	73·7	23·0	85·2	146·7	70·8	84·7	77·5
October	29·769	29·906	29·760	99·9	70·0	29·9	98·7	71·5	27·2	85·1	143·4	68·6	87·1	76·7
November	29·827	29·941	29·758	99·9	70·0	29·9	98·3	72·6	25·7	85·4	143·8	63·8	86·2	75·6
December	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Yearly Sums, Means, and Totals ...	29·835	29·983	29·759	99·1	70·8	28·3	96·5	73·0	23·5	84·7	143·5	69·4	85·3	76·1

Trincomalee, Ceylon. Lat. 8° 30′ N.

January	...	...	...	91·2	68·0	23·2	87·8	71·6	16·2	79·7	...	...	82·7	76·5
February	...	...	...	94·8	65·4	29·4	91·7	71·3	20·4	81·5	...	...	84·7	76·6
March	...	...	...	96·4	70·0	26·4	94·0	71·8	22·2	82·9	...	...	86·6	78·7
April	...	...	...	105·0	68·2	36·8	97·7	73·7	24·0	85·7	...	...	88·4	80·5
May	...	...	...	105·0	70·2	34·8	100·7	75·3	25·4	88·0	...	...	91·3	81·6
June	...	...	...	103·0	74·0	29·0	99·2	75·2	24·0	87·2	...	...	91·0	78·2
July	...	...	...	104·0	69·0	35·0	100·2	73·6	26·6	86·9	...	...	90·2	78·7
August	...	...	...	100·4	68·0	32·4	96·0	72·4	23·6	84·2	...	...	86·8	78·4
September	...	...	...	103·4	66·8	36·6	96·3	72·0	24·3	84·1	...	...	87·1	78·9
October	...	...	...	103·4	67·4	36·0	97·1	71·4	25·7	84·3	...	...	87·9	77·8
November	...	...	...	92·4	65·8	26·6	89·5	69·5	20·9	79·5	...	...	81·9	77·1
December	...	...	...	90·0	67·6	22·4	88·3	70·3	18·0	79·3	...	...	82·2	76·5
Yearly Sums, Means, and Totals ...	...	...	...	99·1	68·4	30·7	94·8	72·3	22·5	83·6	...	...	86·7	78·3

Newera Ellia, Ceylon. Lat. 6° 48′ N.

January	...	...	...	77·2	25·0	52·2	72·6	40·2	32·4	56·4	129·3	39·4	64·2	59·4
February	...	...	...	85·0	25·0	60·0	78·8	36·2	42·6	57·5	134·6	30·9	67·8	58·9
March	...	...	...	87·4	29·2	58·2	83·8	33·8	50·0	58·8	142·9	29·2	70·4	60·2
April	...	...	...	75·5	41·0	34·5	70·0	51·2	18·8	60·6	105·0	37·5	66·5	60·2
May	...	...	...	90·7	33·5	57·2	82·4	43·8	38·6	63·1	136·5	34·4	70·0	62·2
June	...	...	...	73·5	4·0	24·5	70·6	52·3	18·3	61·4	109·4	44·8	61·3	58·6
July	...	...	...	81·0	43·0	33·0	71·7	50·2	21·5	61·0	121·2	40·7	63·2	59·0
August	...	...	...	78·0	43·0	25·0	71·4	49·7	21·7	60·5	126·9	39·3	63·1	59·1
September	...	...	...	78·0	42·0	36·0	70·6	49·2	21·4	59·9	127·9	39·3	62·3	59·0
October	...	...	...	79·0	31·8	47·2	71·6	46·3	25·3	58·9	132·1	34·3	63·4	59·7
November	...	...	...	79·8	37·3	42·5	73·4	45·3	28·1	59·3	133·7	33·1	68·7	61·0
December	...	...	...	80·0	22·3	57·7	74·9	39·3	35·6	57·1	136·5	27·8	65·6	61·3
Yearly Sums, Means, and Totals ...	...	...	...	80·4	35·2	45·2	74·3	44·8	29·5	59·5	128·0	35·9	65·5	59·9

The Return for December was too incomplete to be of any use.

No. XXXII—*continued.*

taken at Stations in the Island of Ceylon, in the year 1869.

Long. 79° 49′ E. Height above Sea 18 feet.

Hygrometrical Results from Glashier's Tables (3rd edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	18 Feet above the Ground.
											lbs. per sq. foot	Miles.				Inches	Inches
67·3	·671	7·1	5·7	55·9	504·6	15·50	15·00	0·25	0·25	0·00	...	149·4	1·4	5·1	2	5·02	4·75
67·6	·676	7·2	5·1	58·2	505·9	12·50	12·50	1·50	1·50	0·00	...	133·3	1·3	5·3	4	2·14	1·75
68·6	·700	7·4	5·4	58·0	505·1	15·00	15·00	0·50	0·50	0·00	...	127·2	1·4	5·4	4	9·03	6·57
75·4	·880	9·3	4·4	68·2	501·6	6·25	6·75	9·25	7·75	0·00	...	163·2	5·5	5·4	16	5·83	4·50
67·1	·665	7·1	5·5	55·5	504·9	5·25	5·25	10·25	10·25	0·00	...	828·0	1·7	5·2	4	6·02	5·50
75·0	·867	9·2	3·3	74·0	504·0	0·00	0·00	15·25	14·75	0·00	...	220·9	1·2	5·3	13	16·53	10·24
72·3	·794	8·4	4·2	66·0	503·9	1·25	1·25	14·25	14·25	0·00	...	109·2	1·4	5·2	14	21·77	18·00
66·8	·658	6·9	6·6	52·4	502·9	0·75	0·75	14·75	14·75	0·00	...	...	1·4	5·3	10	17·44	8·00
72·8	·808	8·6	4·1	67·2	505·0	1·25	1·25	13·75	13·75	0·00	...	111·1	1·4	5·3	13	18·78	15·25
70·0	·735	7·7	5·9	56·8	501·2	0·00	0·00	15·50	15·50	0·00	...	124·4	1·3	5·2	19	21·17	14·87
68·7	·703	7·4	5·9	56·2	503·1	0·00	0·00	15·00	15·00	0·00	...	117·5	1·6	5·2	15	22·90	18·51
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
70·1	·741	7·8	5·1	60·8	503·8	57·75	57·75	110·25	108·25	0·00	...	198·4	1·6	5·3	114	136·62	107·94

Long. 82° 0′ E. Height above Sea 25 feet.

72·4	·794	8·5	3·4	71·2	...	15·50	15·50	0·00	0·00	0·00	...	...	6·4	...	18	6·58	...
71·3	·768	8·2	4·5	64·3	...	10·75	12·50	3·25	1·50	0·00	...	...	5·1	5·5	6	0·75	...
73·6	·831	8·7	4·7	65·0	...	8·75	18·25	3·00	1·00	0·00	...	...	3·7	4·6	...	...	...
75·5	·882	9·3	4·9	65·8	...	4·75	17·00	7·25	1·00	0·00	...	...	5·3	5·2	8	3·19	...
75·6	·886	9·2	6·2	59·9	...	1·25	14·25	12·50	3·00	0·00	...	...	5·7	4·4	5	1·31	...
70·2	·738	7·7	7·5	50·6	...	0·00	11·75	13·00	5·25	0·00	...	...	6·5	3·8	1	0·02	...
71·7	·772	8·1	6·8	54·5	...	1·00	4·50	14·00	11·50	0·00	...	...	6·0	4·7	5	1·55	...
73·0	·814	8·7	5·0	63·2	...	1·25	4·75	13·50	11·50	0·00	...	...	7·0	5·3	10	3·14	...
73·7	·831	8·7	4·9	64·3	...	2·50	5·50	11·50	10·50	0·00	...	...	6·9	5·3	12	5·91	...
71·3	·769	8·0	5·9	57·7	...	1·50	3·50	13·00	13·00	0·00	...	...	5·6	5·1	7	3·40	...
73·8	·837	8·9	2·7	76·9	...	11·25	11·25	3·75	3·75	0·00	...	...	7·0	6·7	23	22·06	...
72·7	·804	8·5	3·1	73·2	...	15·50	15·50	0·00	0·00	0·00	...	...	6·2	6·5	21	8·73	...
72·9	·810	8·5	5·0	63·9	...	74·00	134·25	94·75	62·00	0·00	...	...	5·9	5·2	116	56·64	...

Long. 80° 48′ E. Height above Sea 6,200 feet.

55·4	·440	4·9	1·7	73·2	...	0·00	30·00	0·50	0·50	0·00	...	...	4·6	3·5	17	8·06	...
51·9	·386	4·3	3·2	56·4	...	0·00	27·50	0·50	0·00	0·00	...	...	2·9	3·1	6	0·12	...
52·4	·394	4·3	3·8	52·6	...	0·00	22·50	7·50	1·00	0·00	...	...	2·7	3·1	8	1·49	...
55·1	·434	4·8	2·3	67·0	...	5·75	4·25	7·75	3·75	8·50	...	...	4·9	...	14	1·40	...
56·2	·452	4·9	3·0	61·8	...	10·25	4·25	2·25	11·25	3·00	...	...	2·7	...	13	2·06	...
56·3	·454	5·0	1·0	84·1	...	0·00	0·00	0·00	30·00	0·00	...	...	7·7	...	27	11·82	...
55·4	·441	4·9	1·6	76·2	...	0·00	0·75	1·75	28·50	0·00	...	...	6·2	...	26	8·57	...
55·7	·445	4·9	1·5	77·1	...	0·00	0·00	0·00	31·00	0·00	...	...	7·5	...	28	9·86	...
56·2	·452	5·0	1·2	80·5	...	0·00	0·00	0·00	30·00	0·00	...	...	8·0	4·6	27	8·97	...
56·6	·460	5·1	1·4	68·9	...	8·25	0·00	6·75	15·00	1·00	...	...	7·2	4·7	24	9·36	...
55·0	·433	4·7	2·9	61·2	...	6·75	10·50	7·50	5·25	0·00	...	...	6·2	6·0	26	9·31	...
57·8	·480	5·3	1·6	76·5	...	3·00	10·00	12·50	5·50	0·00	...	...	2·8	5·9	18	11·25	...
55·3	·439	4·8	2·1	69·6	...	34·00	109·75	47·00	161·75	12·50	...	...	5·3	4·4	234	82·27	...

KANDY. Lat. 7° 18′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
January	...	...	...	98·0	58·4	39·6	90·4	63·8	26·6	77·1	...	...	79·2	72·4
February	...	...	...	96·8	52·4	44·4	93·3	62·3	31·0	77·8	...	...	81·3	73·1
March	...	...	...	105·0	61·0	44·0	98·9	64·3	34·6	81·6	...	...	86·5	75·6
April	...	...	...	104·0	60·4	43·6	97·3	65·3	32·0	81·2	...	...	86·4	77·2
May	...	...	...	103·8	62·0	41·8	94·5	66·5	28·0	80·5	...	...	85·4	77·0
June	...	...	...	91·0	64·5	26·5	85·0	66·9	18·1	75·9	...	...	78·0	73·9
July	...	...	...	100·8	62·4	38·4	87·8	66·0	21·8	76·9	...	...	78·0	73·9
August	...	...	...	95·0	60·0	35·0	87·9	64·6	23·3	76·2	...	...	78·9	73·4
September	...	...	...	94·0	63·0	31·0	88·2	64·8	23·4	76·5	...	...	79·6	73·5
October...	...	...	...	100·0	57·0	43·0	90·3	63·5	26·8	76·9	...	...	80·0	73·6
November	...	...	...	98·5	60·0	38·5	90·9	63·1	27·8	77·0	...	...	79·4	73·1
December	...	...	...	97·0	56·5	40·5	91·5	62·0	29·5	76·7	...	...	79·9	72·7
Yearly Sums, Means, and Totals ...	...	...	...	98·7	59·8	39·9	91·3	64·4	26·9	77·8	...	...	81·1	74·1

Abstract of Results of Meteorological Observations

Stations, with their Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Mean				Maximum in Sun's rays.	Minimum on Grass.	Hygrometer.	
							Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.			Dry Bulb.	Wet Bulb.
Colombo* ... 18 ft.	29·835	29·983	29·759	99·9	70·0	29·9	96·5	73·0	23·5	84·7	143·5	69·4	85·3	76·1
Trincomalee 25 ,,	...	...	...	105·0	65·4	39·6	94·8	72·3	22·5	83·6	...	...	86·7	78·3
Newera Ellia 6,200 ,,	...	...	...	90·7	22·3	68·4	74·3	44·8	29·5	59·5	128·0	35·9	65·5	59·9
Kandy ... 1,678 ,,	...	...	...	105·0	52·4	52·6	91·3	64·4	26·9	77·8	...	...	81·1	74·1

* Colombo.—The observations extend only over eleven months, December being omitted.

No. XXXII—*continued.*

Long. 80° 48′ E. Height above the Sea 1,678 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Amount of Rain fall.	
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.				On the Ground.	Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
67·7	·679	7·3	3·3	67·8	...	14·25	14·25	0·00	0·00	2·50	...	...	4·6	3·5	9	2·83	...
67·6	·675	7·2	4·2	63·5	...	10·25	10·25	0·50	0·50	6·50	...	...	3·8	3·7	3	1·68	...
68·6	·699	7·3	6·1	55·3	...	9·00	9·00	1·00	1·00	11·00	...	...	3·8	3·9	5	2·61	...
71·3	·766	8·1	5·3	60·4	...	3·00	3·00	8·25	8·25	7·50	...	...	4·7	*	11	7·97	...
71·6	·774	8·2	4·7	62·8	...	0·00	0·00	13·50	13·50	4·00	...	...	9·3	*	10	0·74	...
71·0	·761	8·2	2·1	78·6	...	0·00	0·00	14·00	14·00	2·00	...	...	7·1	6·1	26	9·26	...
70·5	·747	8·0	2·6	75·0	...	0·00	0·00	10·25	10·25	10·50	...	...	6·7	4·7	23	7·60	...
69·6	·726	7·8	2·8	73·0	...	0·25	0·25	9·00	9·00	12·50	...	...	7·2	4·6	20	5·70	...
69·3	·718	7·7	3·2	70·6	...	0·00	0·00	9·25	9·25	11·50	...	...	7·1	3·3	18	9·90	...
69·2	·715	7·6	3·4	69·4	...	0·25	0·25	8·75	8·75	13·50	...	...	*	*	13	13·26	...
68·8	·704	7·6	3·2	69·8	...	7·75	7·75	2·25	2·25	10·00	...	...	6·3	4·7	12	10·70	...
67·8	·680	7·3	3·7	66·2	...	13·75	13·75	0·25	0·25	3·00	...	...	4·3	5·3	12	6·72	...
69·4	·720	7·7	3·7	67·7	...	58·50	58·50	77·00	77·00	94·00	...	...	5·9	4·3	167	78·97	...

taken at Stations in the Island of Ceylon in the Year 1869.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.												
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	In a Cubic Foot of Air.			Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of Calm, or nearly calm, Days.	Calculated from Robinson's Anemometer		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rain fall on the Ground.	Latitude.	Longitude.
		Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.		North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.						
											lbs. per sq. foot	Miles				Inches	° ′	° ′
70·1	·741	7·8	5·1	60·8	503·8	57·75	57·75	110·25	108·25	0·00	...	198·4	1·6	5·3	114	136·62	6 56 N.	79 49 E.
72·9	·810	8·5	5·0	63·9	...	74·00	134·25	94·75	62·00	0·00	...	...	5·9	5·2	116	56·64	8 30 ,,	82 0 ,,
55·3	·439	4·8	2·1	69·6	...	34·00	109·75	47·00	161·75	12·50	...	...	5·3	4·4	234	82·27	6 48 ,,	80 48 ,,
69·4	·720	7·7	3·7	67·7	...	58·50	58·50	77·00	77·00	94·00	...	...	5·9	4·3	167	78·97	7 18 ,,	80 48 ,,

* No Ozone papers.

Appendix

Abstract of Results of Meteorological Observations

GIBRALTAR. Lat. 36° 6′ N.

Month.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Month.	Lowest during Month.	Range during Month.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
January	30·277	30·501	29·889	67·0	42·0	25·0	61·2	49·2	12·0	55·2	74·9	45·5	57·5	54·[illegible]
February	30·268	30·560	29·[illegible]	69·0	41·0	28·0	62·2	49·2	13·0	55·7	88·7	44·3	58·1	5[illegible]
March	29·941	30·412	29·536	68·0	40·0	28·0	62·6	47·2	15·4	54·9	96·8	40·2	57·6	52[illegible]
April	30·096	30·[illegible]	29·894	78·0	46·0	32·0	68·8	52·8	16·0	60·8	104·1	47·7	63·3	58[illegible]
May	29·955	30·[illegible]62	29·683	81·0	52·0	29·0	74·5	56·3	18·2	65·4	119·0	52·8	68·1	63[illegible]
June	30·013	3[illegible]·208	29·866	88·0	55·0	33·0	78·6	60·9	17·7	69·8	118·3	57·5	71·9	67[illegible]
July	29·9[illegible]	30·122	29·867	90·0	61·0	29·0	85·6	65·3	20·3	75·4	127·0	61·3	77·6	70·[illegible]
August	[illegible]·018	30·181	29·841	90·0	65·0	25·0	84·9	69·1	15·8	77·0	112·5	64·0	77·8	72·[illegible]
September	30·029	30·294	29·841	91·0	58·0	33·0	82·2	65·0	17·2	73·6	108·9	60·3	75·9	71·[illegible]
October...	30·065	30·286	29.744	82·0	44·0	38·0	72·1	57·4	14·7	64·7	93·3	52·3	67·2	63·[illegible]
November	30·086	30·415	29·610	71·0	42·0	29·0	64·6	51·4	13·2	58·0	82·9	43·3	60·8	55·[illegible]
December	30·023	30·388	29·495	65·0	36·0	29·0	59·2	45·4	13·8	52·3	77·7	37·2	55·2	50·[illegible]
Yearly Sums, Means, and Totals ...	30·064	30·316	29·757	78·3	48·5	29·8	71·4	55·8	15·6	63·6	100·3	50·5	65·9	61[illegible]

MALTA. Lat. 30° 35′ N[illegible]

January	30·016	30·308	29·565	65·1	41·0	24·1	57·8	50·8	7·0	54·3	109·6	44·4	55·5	50[illegible]
February	30·102	30·388	29·492	65·5	50·1	15·4	62·2	53·4	8·8	57·8	121·6	47·7	59·8	53[illegible]
March	29·523	29·799	28·962	69·6	41·5	28·1	60·8	50·6	10·2	55·7	117·7	44·9	57·8	53[illegible]
April	29·907	30·280	29·540	71·7	49·1	22·6	64·8	55·4	9·4	60·1	122·3	49·9	62·1	56[illegible]
May	29·863	29·993	29·624	87·6	57·1	30·5	75·1	63·5	11·6	69·3	131·2	58·1	71·7	6[illegible]
June	29·889	30·113	29·638	99·0	62·3	36·7	81·9	70·3	11·6	76·1	136·0	64·9	78·4	69[illegible]
July	29·884	30·064	29·701	90·0	69·0	21·0	84·1	74·1	10·0	79·1	139·0	68·4	81·0	73[illegible]
August	29·885	30·007	29·741	93·7	65·2	28·5	83·9	73·2	10·7	78·6	138·6	66·2	81·0	7[illegible]
September	29·958	30·170	29·731	87·1	66·5	20·6	81·2	71·4	9·8	76·3	138·4	63·0	78·8	[illegible]
October...	29·944	30·213	29·609	83·2	58·7	24·5	74·7	65·2	9·5	69·9	130·4	55·4	72·3	[illegible]
November	29·876	30·250	29·647	73·1	54·0	19·1	67·0	59·6	7·4	63·3	118·8	49·8	64·9	[illegible]
December	29·935	30·323	29·328	67·6	45·0	22·6	63·5	56·3	7·2	59·9	112·2	45·2	61·3	[illegible]
Yearly Sums, Means, and Totals ...	29·898	30·159	29·548	79·4	54·9	24·5	71·4	61·9	9·5	66·6	126·3	54·8	68·7	62[illegible]

SCUTARI. Lat. 41° 0′ N.

January	30·160	30·430	29·558	61·2	13·0	48·2	42·7	29·3	13·4	36·0	72·6	23·5	37·5	35[illegible]
February	30·051	30·414	29·894	62·4	27·8	34·6	50·5	35·2	15·3	42·8	89·5	27·5	45·2	42[illegible]
March	29·605	29·917	29·295	75·4	36·8	38·6	60·1	43·3	16·8	51·7	103·4	36·8	53·5	49[illegible]
April	29·928	30·283	29·302	76·0	34·0	42·0	61·3	42·3	19·0	51·8	109·1	35·3	55·8	50[illegible]
May	29·888	30·115	29·657	91·0	40·4	50·6	75·7	51·7	24·0	63·7	124·0	45·0	68·5	62[illegible]
June*	29·871	30·004	29·659	103·6	53·2	50·4	85·5	59·9	25·6	72·7	134·1	53·2	77·4	68[illegible]
July	29·840	30·110	29·632	94·0	54·4	39·6	87·7	61·3	26·4	74·5	135·0	55·6	79·8	70[illegible]
August	29·803	30·017	29·[illegible]0	99·8	55·2	44·6	90·0	65·0	25·0	77·5	137·9	59·9	83·0	74[illegible]
September	29·945	30·166	29·[illegible]7	88·0	50·8	37·2	79·1	56·7	22·4	67·9	125·5	50·9	72·2	65[illegible]
October...	29·990	30·[illegible]05	29·[illegible]70	81·6	41·8	39·8	71·6	52·1	19·5	61·9	111·3	45·0	66·0	61[illegible]
November	29·960	30·[illegible]23	29·367	70·4	27·2	43·2	59·3	42·9	16·4	51·1	92·5	36·4	54·8	50[illegible]
December	30·085	30·556	29·688	66·8	31·6	35·2	55·1	41·5	13·6	48·3	82·1	35·3	50·1	46[illegible]
Yearly Sums, Means, and Totals ...	29·927	30·220	29·599	80·8	38·8	42·0	68·2	48·4	19·8	58·3	109·7	42·0	62·0	50[illegible]

The extraordinary heat of 22nd June occurred on a change of wind from S.W. to N.E. at 2·40 P.M., causing th[illegible] thermometer to rise in five minutes from 97° to 103°; the maximum 103·6 being reached at 3·10 P.M. The readings [illegible] dry and wet bulbs at 3·15 P.M. were 101·4 and 76·6; at 10 P.M. 76·6 and 68·0 respectively.

No. XXXII—*continued.*

taken at Stations in the Mediterranean, in the year 1869.

Long. 5° 20′ W. Height above Sea 50 feet.

Hygrometrical Results from Glaisher's Tables (3rd edition).						Atmospherical Conditions.											
		In a Cubic Foot of Air.				Number of Days for mean Direction of Wind.					Calculated from Robinson's Anemometer.					Amount of Rain fall.	
Mean Temperature of Dew Point.	Mean elastic Force of Vapour.	Mean Weight of Vapour.	Mean additional Weight required for Saturation.	Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	North.	East.	South.	West.	Number of calm, or nearly calm, Days.	Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.	Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	On the Ground.	Feet above the Ground.
											lbs. per sq. foot	Miles				Inches	Inches
51·2	·377	4·2	1·1	79·7	541·3	5·25	16·00	3·25	6·50	0·00	...	127·6	4·3	3·7	5	2·27	1·99
50·3	·366	4·1	1·3	75·5	540·5	7·50	13·50	1·75	5·25	0·00	...	...	2·5	3·8	5	1·36	1·22
47·9	·334	3·7	1·6	70·1	535·4	10·25	3·25	2·75	14·75	0·00	...	670·3	1·7	4·0	6	1·09	0·86
54·3	·422	4·7	1·8	72·8	531·9	9·25	7·50	4·50	8·75	0·00	...	546·0	1·8	3·9	1	0·24	0·20
60·0	·519	5·7	1·9	75·5	523·9	7·50	5·00	0·50	18·00	0·00	...	348·1	2·1	3·3	7	2·53	2·26
63·9	·596	6·5	2·0	75·5	520·6	2·25	19·00	0·00	8·75	0·00	...	344·8	2·0	2·8	1	0·04	0·03
65·4	·627	6·7	3·4	66·2	514·5	3·75	15·75	2·00	9·50	0·00	...	624·8	1·6	3·5	0	0·00	0·00
63·1	·588	7·4	2·8	72·2	514·3	3·00	18·75	3·25	6·00	0·00	...	602·3	3·2	3·0	3	0·25	0·23
67·5	·674	7·2	2·4	75·4	516·3	2·50	15·25	0·75	11·50	0·00	...	712·8	2·5	3·2	1	0·03	0·02
59·8	·516	5·6	1·7	77·5	526·6	*	*	*	*	*	...	*	2·9	3·5	3	1·09	1·04
51·5	·381	4·3	1·7	71·0	534·3	8·25	8·50	3·50	9·75	0·00	...	692·2	4·0	3·6	7	3·30	1·50
46·4	·317	3·6	1·3	72·5	539·6	15·00	5·75	2·25	8·00	0·00	...	626·6	3·4	3·8	13	2·36	2·09
57·2	·484	5·3	1·9	73·6	528·2	74·50	128·25	24·50	106·75	0·00	...	537·8	2·7	3·4	52	14·56	11·44

Long. 14° 30′ E. Height above Sea 111 feet.

																	†
49·6	·319	3·6	1·3	72·0	539·1	12·50	9·75	2·75	5·00	1·00	...	190·2	6·4	4·6	17	6·13	6·01
50·7	·385	4·3	1·5	75·0	535·7	11·00	5·25	2·50	9·25	0·00	...	124·4	4·5	4·5	3	0·19	0·19
46·8	·320	3·6	1·7	66·8	527·9	8·75	3·25	5·25	13·75	0·00	...	197·6	6·0	6·1	16	2·68	2·68
51·1	·376	4·1	2·1	67·6	529·9	10·75	9·50	3·25	6·50	0·00	...	149·9	4·7	5·0	7	0·56	0·55
49·2	·505	5·5	2·9	64·6	518·7	11·00	10·50	5·00	4·50	0·00	...	132·0	4·0	4·6	...	...	...
52·5	·566	6·2	4·3	57·8	512·3	11·25	7·50	3·75	7·50	0·00	...	132·0	3·2	6·5	1	0·01	0·01
57·8	·679	7·2	4·1	64·4	509·2	15·00	7·25	0·50	8·25	0·00	...	96·6	2·1	6·1	1	0·37	0·36
55·1	·641	6·8	4·5	60·4	509·5	16·00	5·00	1·00	9·00	0·00	...	114·1	2·4	5·9	6	0·87	0·84
53·4	·628	6·8	3·8	64·2	512·8	12·75	7·25	2·50	7·50	0·00	...	93·4	1·8	5·8	...	*	*
54·1	·504	5·5	3·1	63·0	519·7	9·25	8·00	4·25	7·50	2·00	...	112·3	4·0	5·7	9	6·25	6·27
57·5	·428	4·7	2·1	69·9	526·2	11·00	7·25	1·50	9·75	0·50	...	150·5	4·5	6·1	11	1·65	1·69
51·5	·379	4·2	1·8	70·5	531·1	8·50	7·25	6·25	9·00	0·00	...	145·8	5·0	5·0	8	3·49	3·50
56·8	·477	5·2	2·7	66·3	522·7	137·75	87·75	38·50	97·50	3·50	...	136·5	4·0	5·5	79	22·20	22·10

Long. 29° 3′ E. Height above Sea 60 feet.

32·5	·185	2·1	0·5	82·7	562·3	‡ 12·25	‡ 11·00	‡ 2·25	‡ 3·00	‡ 0·50	...	274·9	7·1	6·4	20	2·09	1·21
38·7	·235	2·7	0·7	78·2	551·3	6·00	2·25	10·00	5·75	1·00	...	151·7	4·0	5·3	10	0·74	0·66
45·4	·303	3·4	1·2	73·9	533·8	7·25	3·75	13·50	4·50	0·00	...	209·2	7·2	6·2	20	2·59	2·29
46·4	·317	3·6	1·4	70·5	537·1	10·25	6·00	7·25	3·00	0·50	...	201·8	5·6	6·1	9	0·59	0·47
57·4	·473	5·2	2·4	67·0	522·5	10·25	5·50	6·50	5·75	1·50	...	144·3	3·2	4·9	6	0·35	0·31
62·1	·559	6·0	4·1	59·4	513·2	11·50	5·00	7·25	4·25	2·00	...	146·1	3·3	4·8	6	0·67	0·61
63·8	·592	6·4	4·6	57·8	510·1	12·25	6·50	5·00	4·25	0·00	...	160·2	3·0	5·5	3	0·79	0·70
59·2	·712	7·6	4·4	62·8	505·7	11·00	9·25	5·75	3·00	0·00	...	170·6	2·6	4·4	5	1·99	1·76
59·6	·512	5·6	3·0	64·2	519·7	13·00	7·50	5·50	2·50	0·50	...	181·8	4·3	6·6	9	1·57	1·42
57·0	·464	5·1	1·9	73·0	527·0	10·00	4·75	7·25	5·00	3·00	...	142·2	4·1	6·2	7	3·37	3·24
55·8	·308	3·5	1·4	71·2	539·0	6·00	2·75	10·75	9·00	0·00	...	256·8	5·8	6·7	15	4·30	3·77
42·1	·268	3·0	1·1	74·7	546·4	6·25	9·00	9·00	4·25	0·00	...	219·1	5·8	6·4	12	2·26	1·95
50·2	·411	4·5	2·2	69·6	530·7	116·00	73·25	90·00	54·25	9·00	...	188·3	4·6	5·8	122	21·31	18·39

* Broken. † 26 feet above the ground. ‡ 22·50 days' Wind short.

Appendix

Abstract of Results of Meteorological Observations

Stations, with this Height above the Sea.	Readings of the Barometer.			Temperature of the Air.							Mean Daily Readings of			
							Mean.						Hygrometer.	
	Mean reduced and corrected to 32°.	Highest reduced and corrected to 32°.	Lowest reduced and corrected to 32°.	Highest during Year.	Lowest during Year.	Range during Year.	Of all the highest.	Of all the lowest.	Daily Range.	Approximate Temperature.	Maximum in Sun's rays.	Minimum on Grass.	Dry Bulb.	Wet Bulb.
Gibraltar* 50 feet	30·064	30·316	29·757	91·0	36·0	55·0	71·4	55·8	15·6	63·6	100·3	50·5	65·9	61·1
Malta 111 ,,	29·898	30·159	29·548	99·0	41·0	58·0	71·4	61·9	9·5	66·6	126·3	54·8	68·7	62·0
Scutari 60 ,,	29·927	30·220	29·59[illegible]	103·6	13·0	90·6	68·2	48·4	19·8	58·3	109·7	42·0	62·0	50·6

*Gibraltar.—Direction of wind not registered during October.

No. XXXII—*continued.*

taken at Stations in the Mediterranean in the Year 1869.

Mean Temperature.	Hygrometrical Results from Glaisher's Tables (3d edition).					Atmospherical Conditions.												
	Mean elastic Force of Vapour.	In a Cubic Foot of Air.		Mean Degree of Humidity.	Mean Weight of Cubic Foot of Air.	Number of Days for mean Direction of Wind.				Number of calm, or nearly calm, Days.	Calculated from Robinson's Anemometer.		Amount of Cloud 0—10.	Ozone Scale 0—10.	Number of Days on which Rain fell.	Rain fall on the Ground.	Latitude.	Longitude.
		Mean Weight of Vapour.	Mean additional Weight required for Saturation			North.	East.	South.	West.		Mean daily pressure of Wind.	Mean daily Horizontal Movement of the Air.						
											lbs. per sq. foot	Miles				Inches	° ′	° ′
	·484	5·3	1·9	73·6	528·2	74·50	128·25	24·50	106·75	0·00	...	557·8	2·7	3·4	52	14·56	35 6 N.	5 20 W.
	·477	5·2	2·7	66·3	522·7	137·75	87·75	38·50	97·50	3·50	...	136·5	4·0	5·5	79	22·20	30 35 ,,	14 30 E.
	·411	4·5	2·2	69·6	530·7	116·00	73·25	90·00	54·25	9·00	...	188·5	4·6	5·8	122	21·31	41 0 ,,	29 3 ,,

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